Cardiac Stress Treadmills
Service Manual

P/N 042099-001 Rev A

This is the CE marking of conformity indicating that the device having this symbol on its immediate label meets the applicable requirements of the European Medical Device Directive.

Authorized European Representative
Medical Device Safety Service
Burckhardtstr. 1
D-30163 Hannover, Germany

Caution! **Due to rapid changes in computer technology, the specifications provided in this manual are subject to change without notice.**

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Cardiac Stress Treadmills Service Manual
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Preface

This manual contains information for servicing and repairing the Cardiac Stress treadmills, models TM55/TM65 and ST55/ST65, to the module level. The manual covers both domestic and international versions of the treadmills, which can differ in voltage and mandatory emergency stop button.

This manual is designed for authorized service personnel with proper training. There are no user-serviceable parts in the treadmills. Any attempt by non-authorized personnel to service the treadmill may void the warranty. For service information in the USA, call 800-426-0337. Users located outside the USA should contact their dealer.

Before servicing the treadmill, read the safety requirements listed in Appendix A.

- Use this manual only when servicing Cardiac Stress treadmills. Do not use if for other treadmills.

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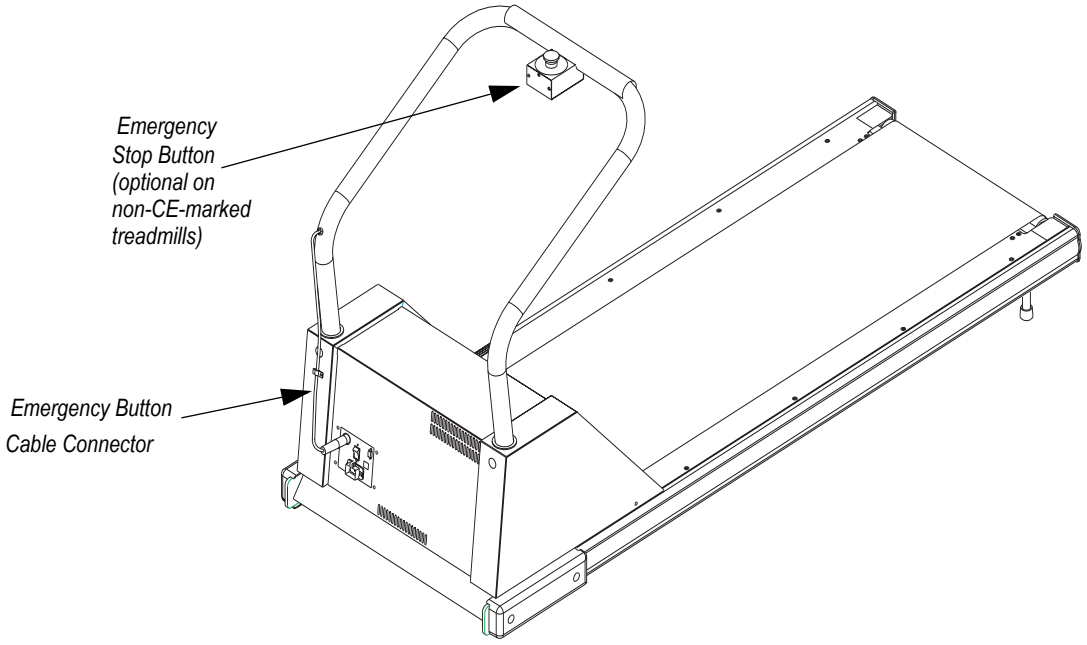
Introduction

Cardiac Stress medical treadmills are designed specifically for stress test applications. The treadmills are not intended to operate independently or with a treadmill controller. They are designed for use in conjunction with the stress family of exercise test devices (referred to in this manual as the stress monitor).

Four stress treadmill models are available: the TM55/TM65 used with the Quinton Q-Stress Cardiac Stress system and the Burdick Quest Exercise Stress system, and the ST55/ST65 used with other Quinton stress systems such as the Q-4500 and the Q710.

The cardiac stress treadmill comes in two voltage ranges: 100-120 VAC (low voltage unit) and 200-230 VAC (high voltage unit). High voltage units have a detachable power cord. An emergency stop button is standard on all CE-marked units and optional on non-CE-marked units.



Controls

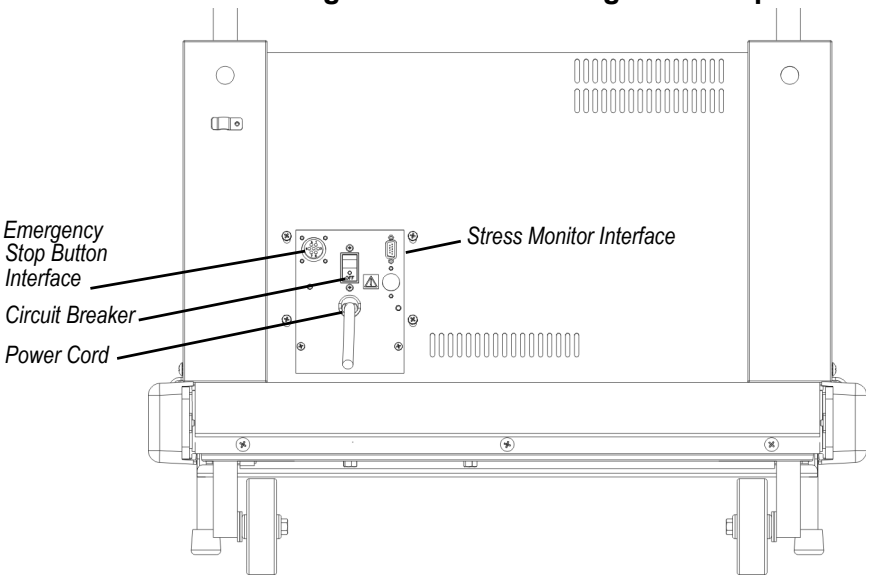
Operation

The treadmill must be connected to the stress monitor. Except for the emergency stop button, all commands, including walking belt power, speed, grade, and protocol, are entered from the stress monitor. All patient data appears on the stress monitor screen.

Power

The treadmill must be plugged into a dedicated power outlet. The treadmill circuit breaker, located on the front of the treadmill hood, must be set to ON and the stress monitor power must be on for the treadmill to operate.

WARNING! Always turn off the circuit breaker on the treadmill before connecting to or disconnecting from the power source.



Emergency Stop Button

The treadmill may have an emergency stop button located on the front handrail: the button is optional on non-CE-marked units. When pressed, the button cuts power to both the belt motor and the grade motor. **The stop button is intended only for an emergency situation.**

Indicators

There are no visual indicators on the treadmill. All patient responses and warnings appear on the stress monitor screen.

Installation

Complete treadmill installation procedures, including site requirements, are given in Appendix C of the *Cardiac Stress Treadmill User Guide* (P/N 042101-00x).

2

Theory of Operation

Overview

The treadmill consists of two subassemblies: the headframe and the deck and roller assembly. The stress monitor, which is attached by cable to the treadmill, functions as the user interface.

The user enters all treadmill commands through the stress monitor system with the information appearing on the monitor's display. The stress system processes the information and sends commands to the headframe assembly.

Headframe Assembly

The headframe assembly receives speed and grade commands from the stress monitor. The assembly includes the drive and grade systems and the electronics that drive these systems. A three-phase AC motor drives the walking belt. A DC motor moves the front of the treadmill up or down to simulate hills. The drive motor supplies torque and speed to the drive pulley through a drive belt.

Deck and Roller Assembly

The deck and roller assembly is attached to the headframe and supports the rear of the treadmill. It provides the platform for the walking belt. The drive belt supplies torque to the walking belt through the drive roller pulley.

Stress Monitor to Treadmill Interface

The TM treadmill communicates with the stress monitor through a standard RS232 interface. The ST treadmill communicates with the stress monitor through an RS422 interface.

Headframe Assembly

The headframe assembly consists of the following components:

- Input power module
- Drive board assembly
- Transformer assembly
- Drive motor assembly
- Grade motor assembly
- Grade system consisting of a pinion shaft, rack gears, feedback potentiometer, and limit switches.

Input Power Module

The input power module receives line power from the power outlet. All treadmills sold for use in the United States and Canada use 115 or 230 VAC power. All units sold for use in Europe use 230 VAC power. The power input module also has a connector for use with the emergency stop switch. The emergency stop switch is an optional item on non-CE-marked units but is standard on units sold with the CE mark.

Drive Board

The drive board on the AC Drive Module uses line power to develop 300 VDC that is then used to create three-phase power for the drive motor assembly. The frequency of the three-phase signal sent to the drive motor determines the drive motor rotational speed. The motor current draw is a function of the torque load placed on the motor through the deck assembly by the user.

The drive board on the AC Drive Module also uses AC power to generate a half wave rectified signal used to drive the grade motor. Two solid state relays drive the grade motor: one in the direction of increasing grade, the other in the direction of decreasing grade.

Transformer Assembly

The transformer provides electrical isolation between the primary and secondary voltages. It also provides stepped down voltages for use with the control electronics.

Drive Motor Assembly

The drive motor, which is driven by the drive board, delivers torque and speed to the front roller of the treadmill through a poly-V drive belt and a set of appropriate speed reduction pulleys. A flywheel, integral to the motor poly-V pulley, is used to average the pulsing runner loads.

Grade Motor Assembly and System

The grade motor drives the grade pinion shaft using a chain and a set of speed reduction sprockets. The grade pinion shaft in turn drives a set of rack gears, which raise and lower the front of the treadmill.

A grade potentiometer senses the rack gear movement for the grade system feedback. Limit switches limit the travel of the rack gears in the event of a potentiometer failure or incorrect calibration.

Deck and Roller Assembly

The deck and roller assembly provides the running surface for the user. This surface consists of a movable and flexible walking belt supported by a semi-rigid platform. This platform is supported by a steel-welded frame.

A poly-V drive belt, coupled through a pulley to the drive motor, drives the front roller. The front roller uses friction to drive the walking belt. A rear roller, acting as an idler pulley, tensions the walking belt. Both rollers are mounted to the steel support structure.

3

Troubleshooting

Diagnosis

The tables and flow charts in this chapter cover the following potential problems.

Electrical Problems

- Power
- Cable connections

Electronic Problems

- AC Drive Module
- PCB
- Signals

Mechanical Problems

- Noise
- Vibration
- Grade
- Speed
- Belts

Use the tables and flow charts on the following pages to diagnose problems. See Chapter 4 for repair and replacement procedures.

Tools

The following tools may be required:

- Phillips and flatblade screwdrivers
- ½-inch hex wrench
- Mechanical stethoscope
- Digital multi-meter

Warning! **High voltage is present under the hood when the treadmill is plugged into a power source; residual high voltage remains for a few minutes after the power is removed. Turn**

off the treadmill circuit breaker, then unplug the treadmill from the power source before removing the hood. Use extreme caution at all times when the hood is removed.

Secure loose clothing, jewelry, and long hair before working near treadmill parts.

Never place your fingers near rotating parts.

Do not start the walking belt when someone is on the treadmill.

Electrical Problems

Treadmill Does Not Start

Possible Cause	Action
Treadmill not plugged in.	Plug power cord into appropriate outlet.
Circuit breaker on treadmill set to **Off.**	Set treadmill circuit breaker to **On**.
Building circuit breaker tripped.	Contact building maintenance to reset circuit breaker. If circuit breaker trips again: 1. Check outlet voltage. If necessary, verify that the power at the outlet and at the breaker is the correct rating for the treadmill. 2. Verify that the power cord is not damaged. 3. Replace the configuration plate (faulty in-rush limiter).
Power to the stress monitor not on.	Turn on power to stress monitor.
Power cord damaged.	Remove cord from outlet and replace.
Fuse in treadmill blown.	If any of the transformer primary fuses, F1 or F2, are blown: 1. Check the primary transformer windings for continuity. Should be 2 ohms or less. 2. Replace fuses and if the fuses blow again, isolate mechanical assembly and ensure that no parts are jammed (for example, rack gear in grade change assembly). If F1 or F2 are blown, check the 12 volt power supply.
Control cable between variable speed drive (drive board on the AC Drive Module) and stress monitor is faulty.	Check for bent or broken pins. Replace control cable.
Drive board on the AC Drive Module failure.	Check power supply at test points. Replace AC Drive Module, if necessary.
Configuration plate connection faulty.	Replace configuration plate.
Optional emergency stop button activated.	Push in button and twist counter-clockwise to unlock.

Electronic Problems

Error Codes

Error codes provide the first means of treadmill diagnostics. The treadmill performs an electronic self-test each time that it is powered up. If a problem is detected during either power-up or operation, an error code appears on the stress monitor. Note the code recorded by the owner and reference the table of error codes in the service manual for your stress monitor.

If you replace a faulty PCB Assembly, return it to the factory and note the error code.

Mechanical Problems

Mechanical problems can include noise and vibration caused by loose or worn parts. Use the following tables to diagnose mechanical failures.

Walking belt

Problem	Action
Walking belt slipping.	Adjust walking belt tension (see “Belt Tension” on page 4-23).
Walking belt not tracking.	Adjust tracking (see “Walking Belt Tracking” on page 4-24).
Walking belt worn out.	Replace walking belt (see “Replacing the Walking Belt” on page 4-22).

Drive Belt

Symptom	Possible Cause	Action
Squealing sound similar to automobile fan belt. Walking belt slows when user’s foot strikes the deck.	Drive motor belt (poly-V drive belt) is slipping.	Adjust belt tension or replace belt.
Belt stops and an over-current error code appears.	Stopping the belt for more than 2 seconds when the belt is set to ON can cause an over-current shutdown.	1. Don’t stop belt longer than 2 seconds. 2. Replace the deck and belt.

Treadmill Noise

The following table provides a diagnostic summary of bearing noises, along with other noises that may indicate problems.

Noise	Possible Cause	Action
Knocking* or thumping. Rate increases and decreases with walking belt speed.	Front or rear roller (pulley) assembly bearings.	Isolate** and replace roller.

Noise	Possible Cause	Action
Squealing (similar to loose automobile fan belt).	Drive belt loose.	Adjust belt tension. Replace belt if necessary.
Popping during grade change.	Faulty elevation chain alignment.	Adjust alignment of sprockets.

*The type and the rate of bearing noise can help determine which bearing is at fault. The number of knocks per minute varies with treadmill speed because the roller speeds change as the belt speed changes.

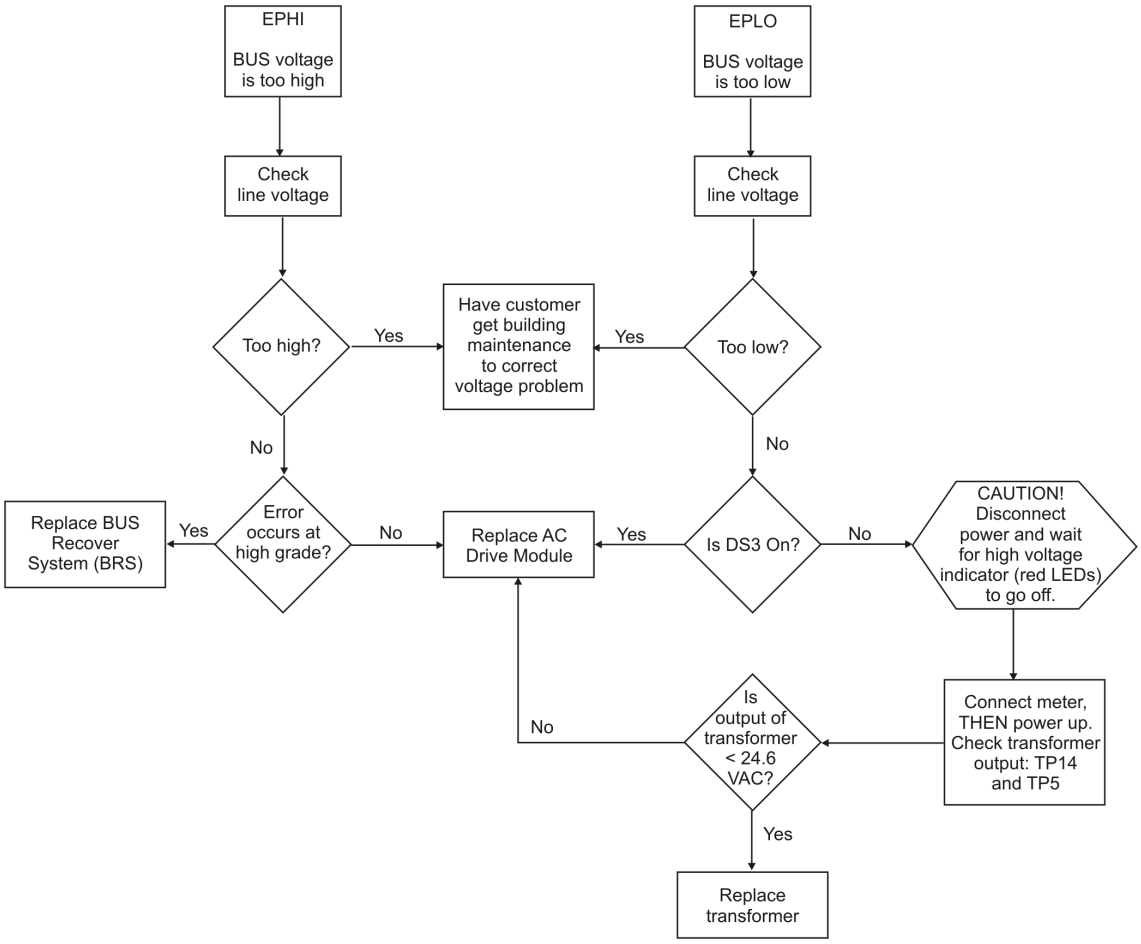
**Use a mechanical stethoscope or a piece of hose about two feet long, to isolate bearing problems. Hold one end of the hose near the suspected bearing and the other end near your ear. Compare several bearings to determine which is the faulty one.

Error Flow Charts

Use the flow charts on the following pages for step-by-step troubleshooting.

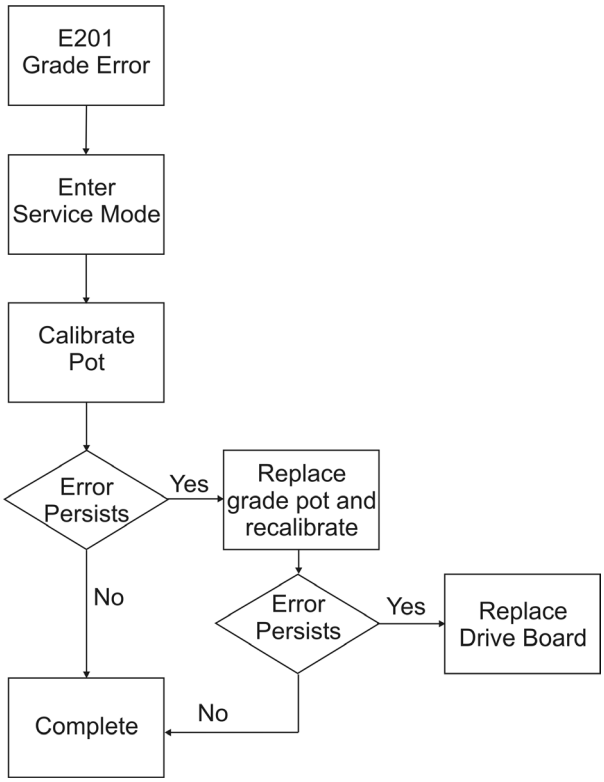
Error Code Flow Chart	Page
EPHI and EPLO	“Bus Voltage Flow Chart” on page 3-5
E201	“Grade Error Flow Chart” on page 3-6
E203 (Drive Motor)	“Drive Motor Flow Chart” on page 3-7
E204	“Communications Link Flow Chart” on page 3-8
Grade Problems	“Grade Problems Flow Chart” on page 3-9

Bus Voltage Flow Chart



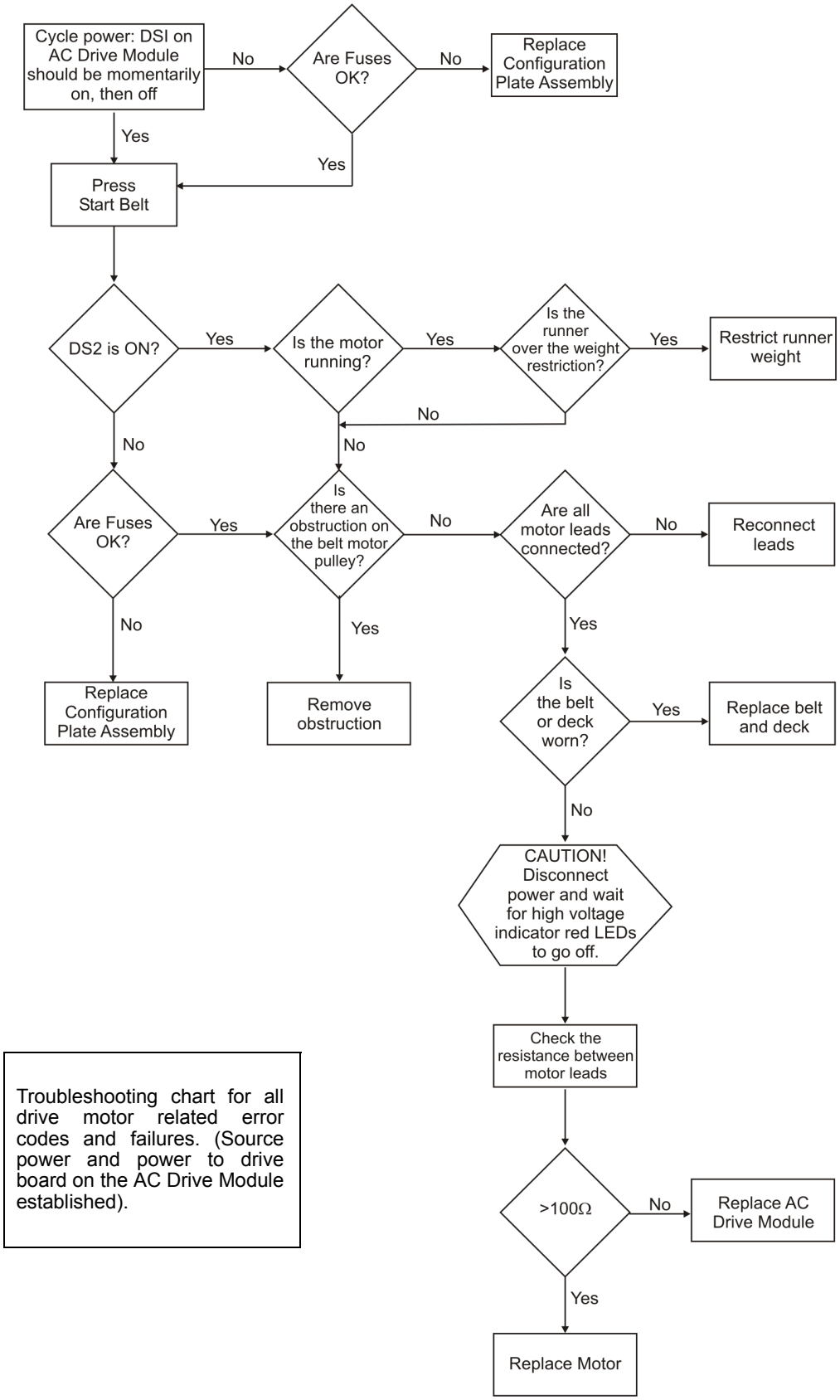
Error Code Flow Chart: EPHI and EPLO

Grade Error Flow Chart



Error Code Flow Chart: E201

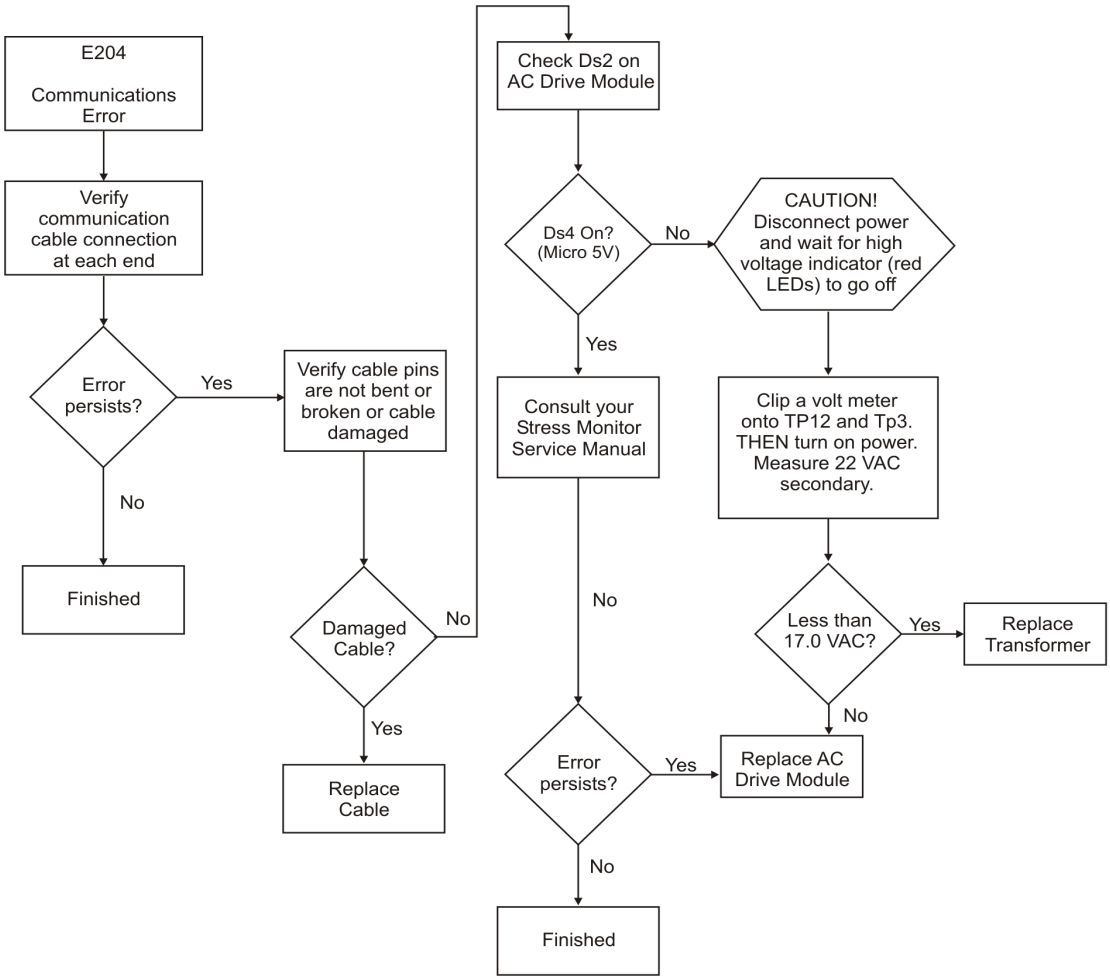
Drive Motor Flow Chart



Troubleshooting chart for all drive motor related error codes and failures. (Source power and power to drive board on the AC Drive Module established).

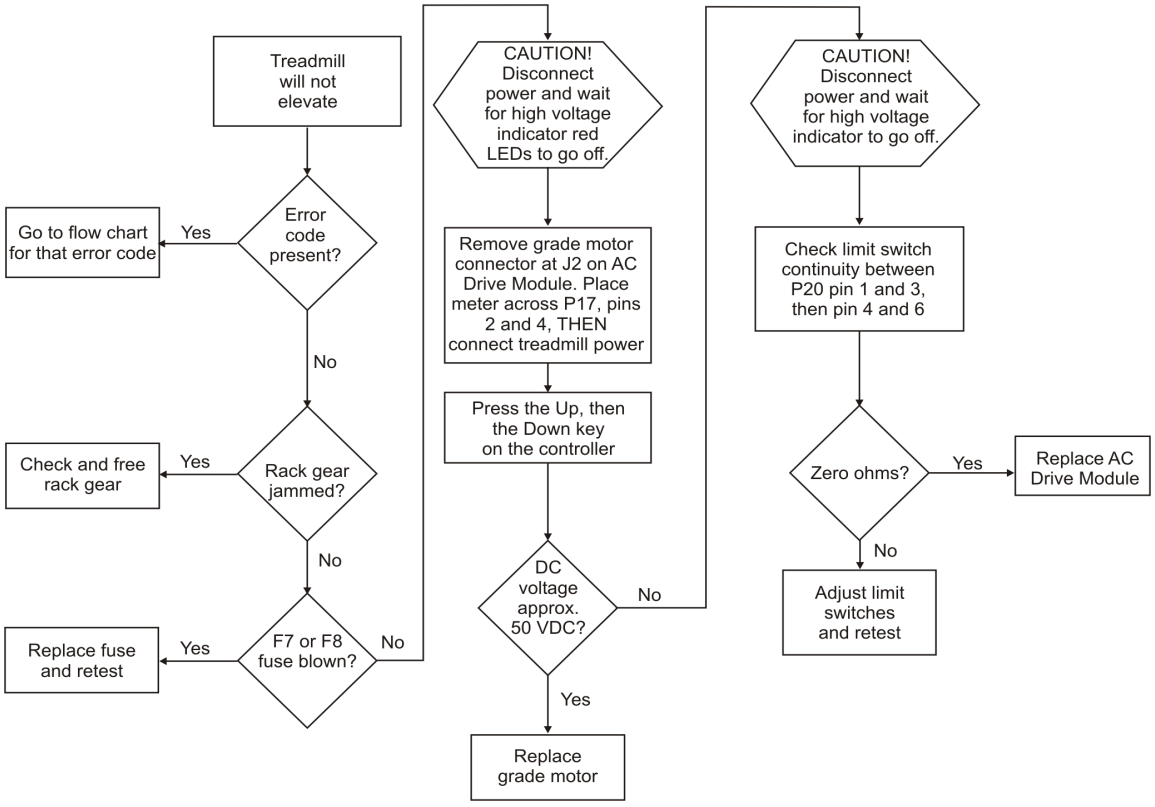
Error Code Flow Chart: E203

Communications Link Flow Chart



Error Code Flow Chart: E204

Grade Problems Flow Chart


Treadmill will not elevate
Error code present?
Yes
Go to flow chart for that error code
No
Rack gear jammed?
Yes
Check and free rack gear
No
F7 or F8 fuse blown?
Yes
Replace fuse and retest
No
CAUTION! Disconnect power and wait for high voltage indicator red LEDs to go off.
Remove grade motor connector at J2 on AC Drive Module. Place meter across P17, pins 2 and 4, THEN connect treadmill power
Press the Up, then the Down key on the controller
DC voltage approx. 50 VDC?
No
Yes
Replace grade motor
CAUTION! Disconnect power and wait for high voltage indicator to go off.
Check limit switch continuity between P20 pin 1 and 3, then pin 4 and 6
Zero ohms?
Yes
Replace AC Drive Module
No
Adjust limit switches and retest

4

Repair/Replacement and Calibration

The procedures that follow apply to the following treadmills: ST55, ST65, TM55, and TM65. Field repair and replacement is to the modular level. No procedures are included for component-level repair.

Electrical Shock

Warning! **High voltage is present beneath the treadmill hood while the treadmill is connected to a power source. Residual high voltages remain for a few minutes after the plug is removed.**

To prevent high-voltage electrical shock:

- **Turn off the treadmill circuit breaker, then unplug the treadmill and stress monitor power cords every time you remove the hood.**
- **Before working on or around any electrical or mechanical component under the hood, wait at least two minutes from the time you unplug the power cord and be sure the red LEDs on the drive board on the AC Drive Module are off.**

The power control on the stress monitor does not turn off electrical current to the treadmill.

Be sure treadmill area is free of liquid spills before removing hood.

Burns

Warning! **Allow pulleys, chain, motor, and other treadmill parts to cool sufficiently before touching them.**

Unplug the treadmill immediately if signs of overheating occur.

Mechanical Hazards

Warning! **Be sure the treadmill power cord is unplugged before working with chains, rack gear, belt, and pulleys.**

Secure long hair, loose clothing, and jewelry before working near the treadmill, particularly near walking surface and rotating parts.

Before running the treadmill, check for worn parts which could break loose during service or operation.

Keep fingers away from rotating parts.

To avoid eye contaminants, clean away dust and debris from moving parts before servicing.

Beware of sharp edges when replacing worn parts.

Do not start the walking belt when someone is on the treadmill.

Improper lifting can cause back strain. It also can cause injury to others if the treadmill is dropped. Lifting the treadmill requires at least two people.

When removing the grade motor and chain, block the treadmill headframe so that the deck will not drop to the floor, causing injury and damage.

Tools

- Phillips and flat blade screwdrivers
- Hex wrenches: 5/32 in., 9/16 in., 7/16 in., 1/2 in., 5/16 in.
- 11/32 in. nut driver
- Heyco® strain relief pliers for replacing power cord (low voltage units only)
- 1/2 in. crowfoot open-end wrench for removing drive motor
- Torque wrench for rack gear replacement, 46± 4ft-lbs
- Frequency counter
- Tachometer
- Wooden blocks
- Belt-tension calipers (optional) P/N 030113-001
- Masking tape or heavy pencil

    - Although some procedures are used for several applications (removing the hood, for example), each procedure is explained only once. Reference procedures under their headings for subsequent applications.
    - All references to front, rear, left, and right are given as though you were facing the front handrail while walking on the deck.

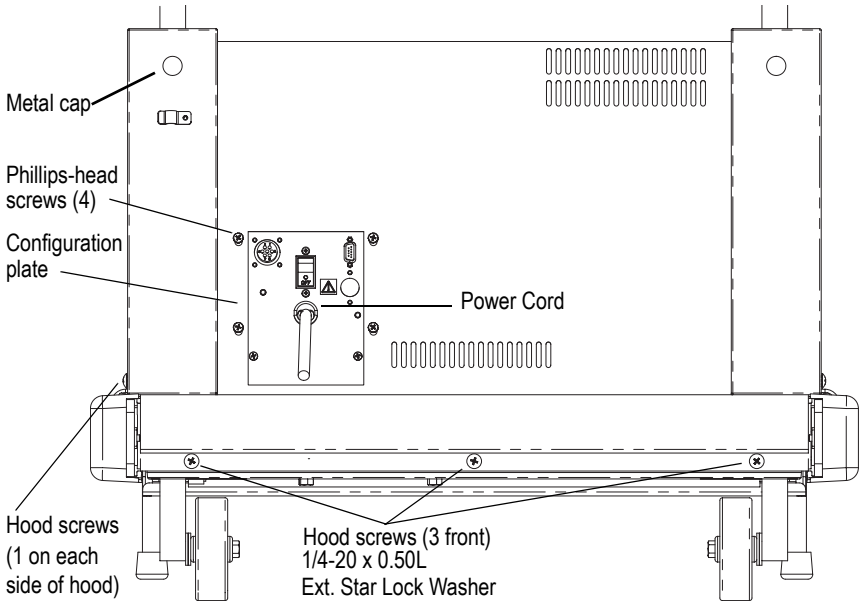
Removing the Treadmill Hood

1. If the preamp for the Q-Stress system is attached to the handrail, remove the preamp from the handrail before attempting to remove the hood.
2. Turn off the circuit breaker on the treadmill hood, then unplug the treadmill and the stress monitor from the power outlets. If the emergency stop button is installed, remove the emergency stop cable from the treadmill configuration plate.

Warning! **To prevent high voltage electrical shock, wait at least two minutes from the time you unplug the power cords before working on or around any electrical or mechanical component under the hood.**

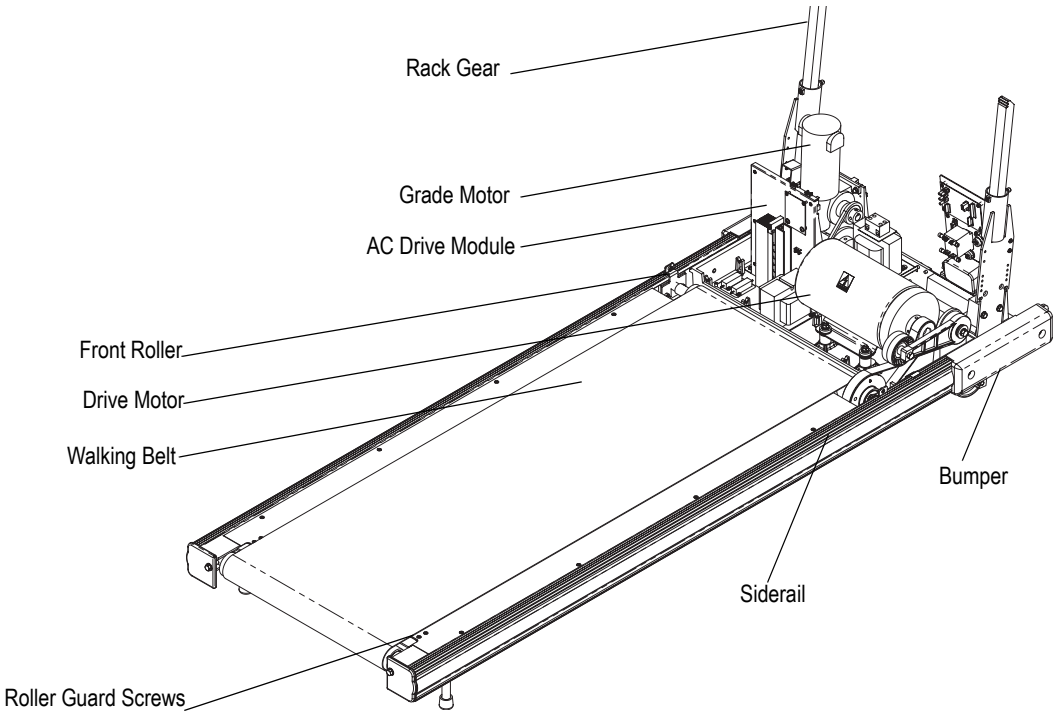
High voltage units: Disconnect the power cord and the emergency button cable (if present) from the configuration plate and remove the power cord retainer bracket.

3. Disconnect the stress monitor system cable from the treadmill.
4. Use a flathead screwdriver to remove the metal cap on each handrail near the front of the hood. Use a 3/16 in. hex wrench to loosen the hex head socket screw inside.
5. Pull the handrail up and out. If necessary, first use a screwdriver to pry the seals loose. Be careful not to damage them.
6. Remove the four Phillips-head screws from the configuration plate.
7. Remove the five Phillips-head screws holding the hood to the headframe: three at the front, below the label panel, and one on each side of the hood.


Metal cap
Phillips-head screws (4)
Configuration plate
Power Cord
Hood screws (1 on each side of hood)
Hood screws (3 front) 1/4-20 x 0.50L Ext. Star Lock Washer

8. Lift the hood straight up and off. (With hard-wired power cords, feed the cord through the hood.)
9. To replace the hood, perform steps 1-8 in reverse order.

- Recommended: vacuum the internal components before replacing the hood or applying power. Use caution near the AC Drive Module. Do not vacuum the drive board on the AC Drive Module.



Treadmill with Hood Removed

Replacing the Configuration Plate

On low voltage units, the configuration plate module includes the power cord, which is attached to the plate. On high voltage units, the power cord is removable and is not part of the configuration plate module.

1. Remove the power cords and treadmill hood as described in "Removing the Treadmill Hood" on page 4-3.
2. Remove the two ¼-20 screws that attach the power cord ground wires to the headframe. The screws are located in the center of the headframe—protective ground is represented by the ground symbol shown to the left. Be sure to rewire correctly.
3. Cut the plastic ties and remove the configuration plate connections. Remove the communication cable. Note the wire colors and connection points
4. Remove the two ¼-20 screws that hold the configuration plate to the headframe.

Caution! Hold the plate so that it doesn't fall.

5. Replace the configuration plate module following steps 2 through 4 in reverse order.
6. If no other service is required, replace the treadmill hood as described in step 9 on page 4-3.

Replacing the Power Cord

Hard-wired Cords on Low Voltage Units

❖ *Tools: Heyco™ strain relief hand pliers*

1. Remove the configuration plate as described on previous page.
2. Use strain relief pliers to squeeze the strain relief on the power cord and pull it free of the configuration plate.
3. Clip the power cord wire ties.
4. Remove the two hex nuts holding the power cord to the line filter: the hex nuts are behind the configuration plate, down and to the right.
5. Pull the power cord out of the configuration plate.
6. Feed the new cord into the configuration plate and complete the procedure by following steps 1 through 4 in reverse order.
    - Twist the power leads before connecting.
    - Connect the white wire to the bottom connector on the line filter.
7. If no other service is required, replace the treadmill hood as described in step 9 on page 4-3.

Detachable Cords on High Voltage Units

Unplug the power cord from the connector on the configuration plate and plug in the new cord.

Replacing the AC Drive Module

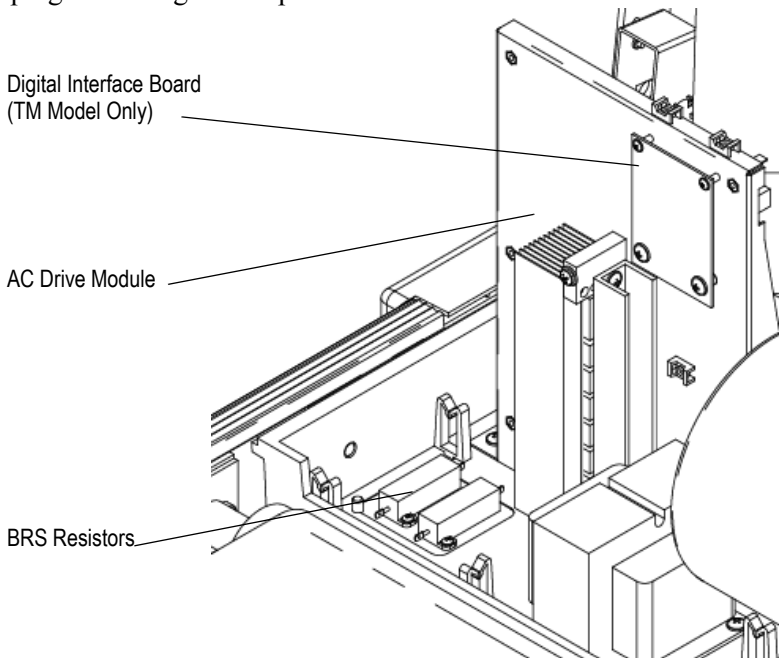
The AC Drive Module with treadmill drive board must be replaced as a unit.

1. Remove the treadmill hood and power as described in "Removing the Treadmill Hood" on page 4-3.

Warning! **To prevent high voltage electrical shock: Before working on or around any electrical or mechanical component under the hood, wait at least two minutes from the time you unplug the power cord and be sure the red LEDs on the drive board on the AC Drive Module are off.**

2. Disconnect the stress monitor cable from the AC Drive Module.
3. For TM models only: remove the four Phillips screws holding the Digital Interface Board (see figure on next page). Carefully set board aside.
    - In the following steps, note the connection points and the colors of the wires as you remove them from the drive module. All the wires are harnessed. Cut the plastic ties to free the wires as necessary. Reference wiring schematic.
4. Unplug the grade motor wires from the drive board on the AC Drive Module.

5. Unplug the isolation transformer wires.
6. Unplug the non-isolation transformer wires.
7. Unplug the grade potentiometer wires. Clip the plastic ties around the cage only, not around the headframe.
8. Unplug the limit switch wires.
9. Unplug the power resistor wires.
10. Unplug the drive motor wires.
11. Unplug the configuration plate wires.



12. Remove the four Phillips screws securing the AC Drive Module.
13. Remove the AC Drive Module and return it to with an authorized return number to authorized technical support.
14. Reassemble using steps 2 through 13 in reverse order.
15. If no other service is required, replace the treadmill hood as described in step 9 on page 4-3.

Bus Recovery System (BRS)

The Bus Recovery System (BRS) uses a bleeder resistor to protect the treadmill from high voltage damage when the treadmill is used at high grade.

Two gold BRS resistors are wired together, then wired to a connector that plugs into the AC Drive Module. The resistors are located on the right side of the head frame near the drive roller (see previous figure).

To replace the BRS resistors:

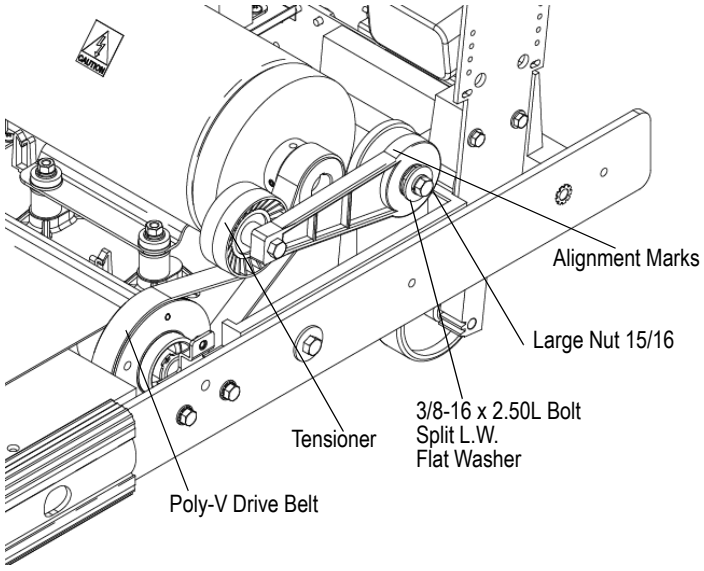
1. Remove the treadmill hood and power as described in “Removing the Treadmill Hood” on page 4-3.
2. Remove the four screws and washers holding the resistors to the headframe.
3. Unplug the resistor wire harness from the AC Drive Module.
4. Install the new resistors and replace the screws and washers.
5. Reconnect the wire harnesses to the AC Drive Module.
6. If no other service is required, replace the treadmill hood as described in step 9 on page 4-3.

Replacing the Tensioner

The tensioner may need to be replaced if the poly-V drive belt slips, if the idler pulley bearing makes noise, or if the tensioner roller is damaged.

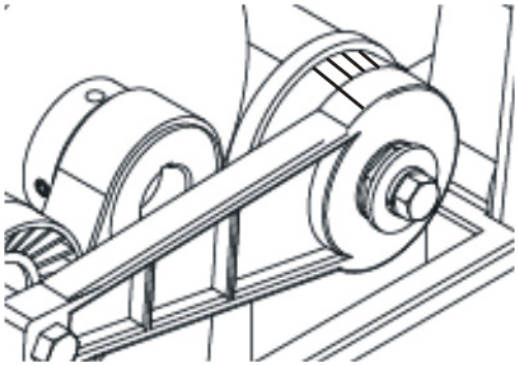
Warning! **Do not attempt to disassemble the tensioner. The internal springs are tightly compressed and could cause injury if released.**

1. Remove the treadmill hood and power as described in “Removing the Treadmill Hood” on page 4-3.
2. Use a 9/16 in. open end wrench to remove the 3/8 in. bolt from the base of the tensioner. Remove and discard the old tensioner.
3. Be sure the drive belt is centered on the motor and roller pulleys.



4. Place the new tensioner onto the headframe in the same position as before and loosely bolt it to the headframe.

5. Use either a 15/16 in. open-end wrench or a large adjustable wrench to turn the **large** nut on the tensioner counter-clockwise; put tension on the poly-V drive belt until the two lines on the tensioner line up (see figure below). Tighten the 3/8 in. bolt to 19 foot-pounds torque.



6. If no other service is required, replace the treadmill hood as described in step 9 on page 4-3.

Replacing the Poly-V Drive Belt

1. Remove the treadmill hood and power as described in "Removing the Treadmill Hood" on page 4-3.

Caution! **The drive belt tensioner is spring loaded. Do not let it snap closed after removing the drive belt.**

2. Note where the tensioner marks are lined up.
3. Loosen the drive belt tensioner by turning the mounting bolt counter-clockwise, then pivot the tensioner away from the belt.
4. Remove the drive belt from the drive pulley.
5. Loosen the roller guard screws.
6. Loosen tension on the walking belt as described in "Belt Tension" on page 4-23.
7. Use a ½-inch socket wrench to remove the end caps from the siderails.
8. Remove the plastic insert from the siderail cover.
9. Loosen the two siderail set screws on the pulley side only.
10. Slide the siderail cover backwards approximately 10 inches to expose the two front-roller retainer bolts.
11. Use a ½-inch wrench to remove the four hex bolts that hold the two front-roller retainers to the frame. There are two bolts on each side of the roller.
12. Pull up the drive roller on the right side and remove the poly-V drive belt from the roller.
13. Replace with a new belt then remount the front drive roller assembly.

- When replacing the belt, be sure to center it on the pulleys.

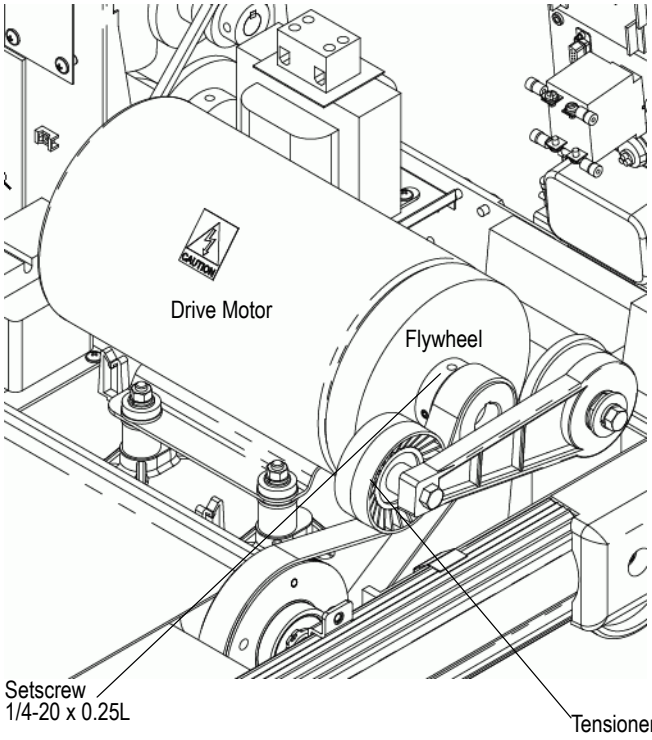
14. Assemble the treadmill following steps 3-10 in reverse order.
15. Tension the walking belt as described in “Belt Tension” on page 4-23.
16. Set the tracking as described in “Walking Belt Tracking” on page 4-24.
17. Adjust the roller guard as described in “Rear Roller Guard Adjustment” on page 4-25.
18. If no other service is required, replace the treadmill hood as described in step 9 on page 4-3.

Replacing the Drive Motor

Replace the drive motor when the motor is inoperative: see Drive Motor flow chart on page 3-7.

1. Remove the treadmill hood and power as described in “Removing the Treadmill Hood” on page 4-3.
2. Release the drive belt tensioner and remove the poly V-belt from the motor drive pulley as previously described on page 4-8.
3. Cut the wire ties that hold the drive motor cable to the headframe and disconnect the motor cable at the AC Drive Module.
4. Remove the configuration plate (see “Replacing the Configuration Plate” on page 4-4).
5. Remove the four hex nuts that hold the motor on the headframe. Note the arrangement of the isolation mounts. (You may need to use a ½-inch clawfoot.)

6. Pull the motor off the headframe.

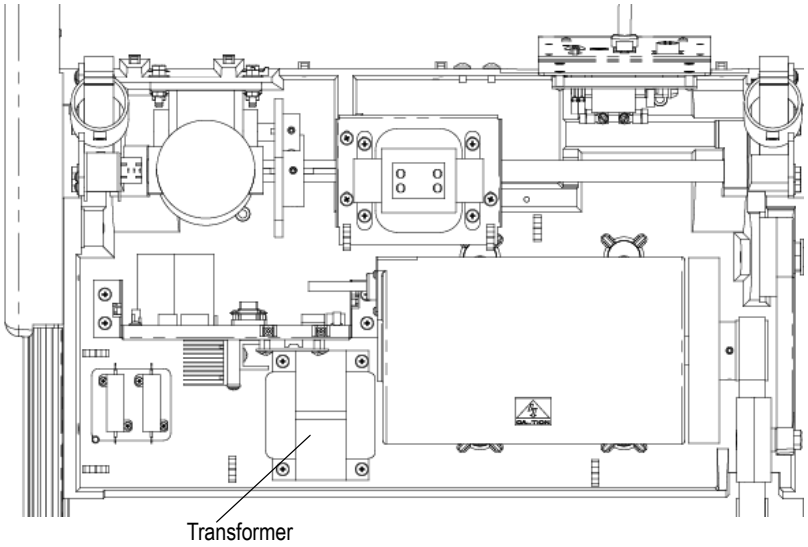


7. Loosen the two setscrews on the flywheel/drive pulley and remove. Use a gear puller to pull the flywheel off the motor shaft.
8. Reinstall the flywheel onto the motor shaft and loosely tighten the setscrews.
9. Replace the motor following steps 3 through 5 in reverse order.
    - The new motor and flywheel assembly must be aligned with the front roller drive pulley. Use a straight-edge ruler placed on the outside of the front roller drive pulley to align the outside face of the motor drive pulley to within 0.020 inch. Tighten the setscrews.
10. Replace the poly drive V-belt as previously described on page 4-8.
11. If no other service is required, replace the treadmill hood as described in step 9 on page 4-3.

Replacing the Transformer

1. Remove the treadmill hood and power as described in “Removing the Treadmill Hood” on page 4-3.
2. Unplug the transformer wires from the configuration plate PCBA board. Note the wire colors and connection points. Cut the plastic cable ties that secure the transformer wiring.
3. Remove the four Phillips-head screws that hold the transformer to the headframe.

4. Discard the old transformer. Replace with a new one using steps 2 through 4 in reverse order.



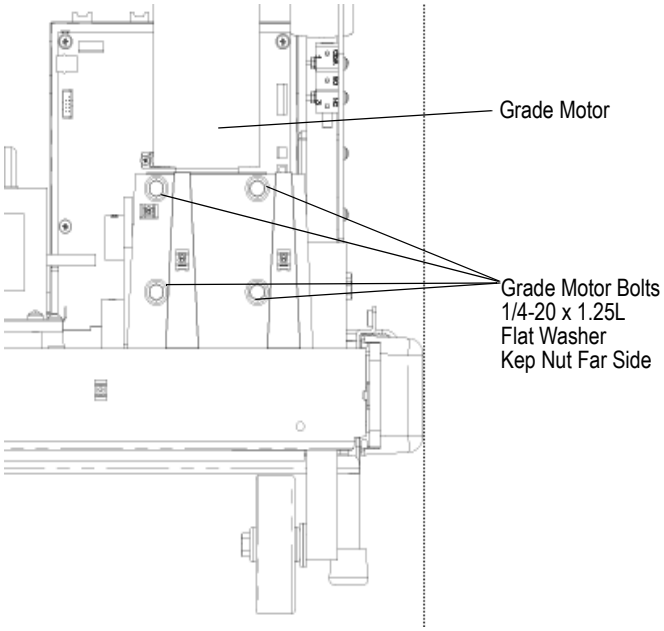
5. If no other service is required, replace the treadmill hood as described in step 9 on page 4-3.

Replacing the Grade Motor

- Place a clean sheet of cardboard or a clean rag on the treadmill deck before starting this procedure.
- Do not elevate the treadmill.

1. Block the treadmill headframe securely with wooden blocks to ensure that the treadmill will not drop when you remove the grade motor.
2. Remove the treadmill hood and power as described in "Removing the Treadmill Hood" on page 4-3.

3. Disconnect the wire connector on the AC Drive Module.



4. Follow the procedure to remove the grade motor chain (see "Grade Motor Chain" on page 4-13).
5. Remove the four 7/16 in. hex head nuts and bolts that attach the grade motor to the headframe, then remove the motor.
6. Loosen the set screw in the grade motor chain sprocket and remove the sprocket.
7. Install a new grade motor, following steps 3-6 in reverse order. Use a straight edge to align the motor sprocket with the pinion shaft chain sprocket.
8. Restore power to the treadmill and stress monitor and test the new grade motor.

Warning! **High voltage is present when the treadmill is plugged into a power source. Secure loose hair, clothing, and jewelry before working near rotating machinery.**

Verify that:

a. the treadmill operates over the full range of 0-25% grade.

b. there is no binding when it moves up or down.

c. the chain is aligned correctly. A popping sound in the chain indicates that it is misaligned.

9. Turn off the power to treadmill and stress monitor. Remove the power cords from the outlets, then replace the treadmill hood as described in step 9 on page 4-3.

Grade Motor Chain

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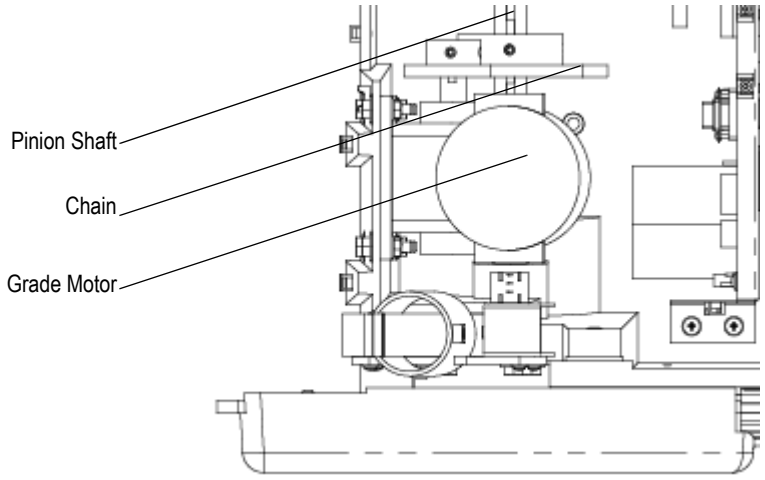
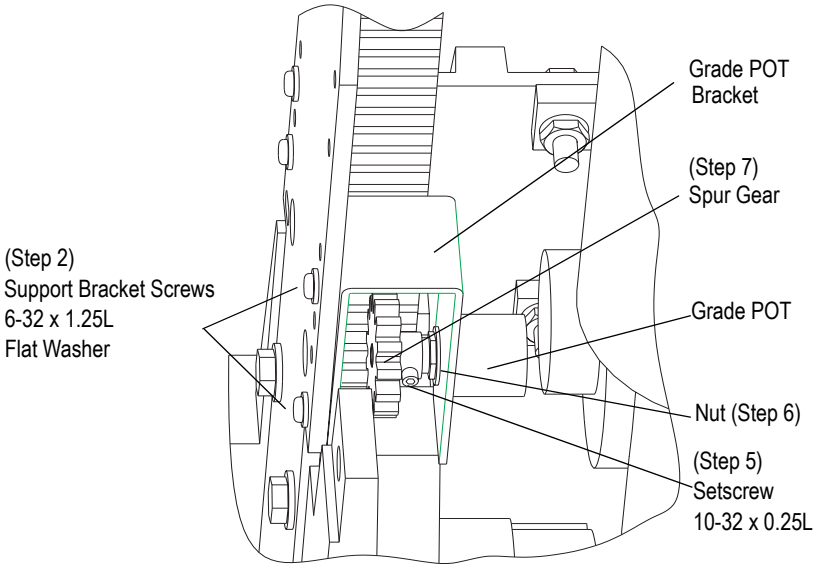


1. Block the treadmill headframe securely with wooden blocks to ensure that the treadmill will not drop when you remove the grade motor.
2. Use a flathead screwdriver to pop off the C-clip master link on the chain.
3. Slide out the master link.
4. Install the new chain, aligning it correctly on the sprockets.
5. Replace the master link.
6. Secure the C-Clip on the master link.
7. If no other service is required, replace the treadmill hood as described in step 9 on page 4-3.

Replacing the Grade Potentiometer (Pot)

1. Remove the treadmill hood and power as described in “Removing the Treadmill Hood” on page 4-3. Use caution throughout the following steps.
2. Remove the two screws from the support bracket.
3. Cut the cable ties.
4. Unplug the cable from the AC Drive Module.
5. Remove the setscrew on the gear wheel.

6. Remove the nut holding the grade pot to the bracket.



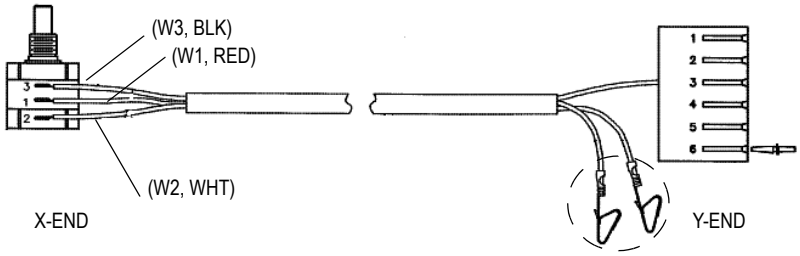
7. Slip the grade pot out of the gear wheel and bracket.
8. Replace with new pot:
   a. Slip the grade pot into the hole in the pot bracket, then into the gear wheel. Tighten the nut to 20 inch-pounds torque.
   b. Use the two screws from step 2 to reinstall the pot bracket, engaging the gear wheel with the rack gear as you install.

Caution! **To prevent damage, don't mesh the gears too tightly. Leave enough clearance for each gear.**

   c. Be sure to leave the setscrew accessible and loose.
   d. See "Grade Pot Wires" below.
9. Calibrate the grade pot as described on page 4-26.

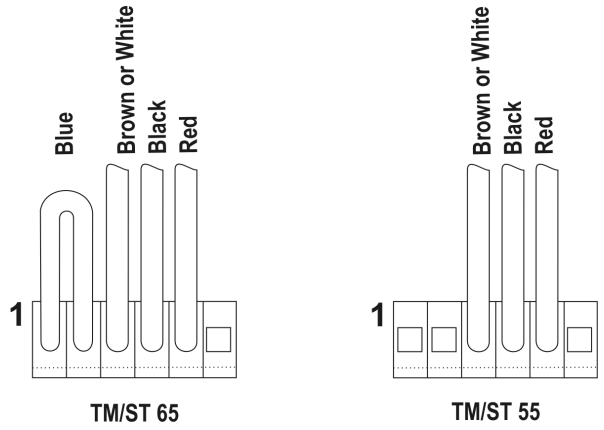
Grade Pot Wires

At the end of each grade pot wire is a pin with a small metal flange. The flange has a corresponding slot on the connector housing.



1. Insert each pin into the connector housing until it clicks slightly. The flanges will be visible through the slots in the housing.

Color	TM/ST 66	TM/ST55
Red wire:	Slot 5	Slot 5
Black wire:	Slot 4	Slot 4
Brown or white wire:	Slot 3	Slot 3
Blue wire	Slots 1 & 2	No blue wire

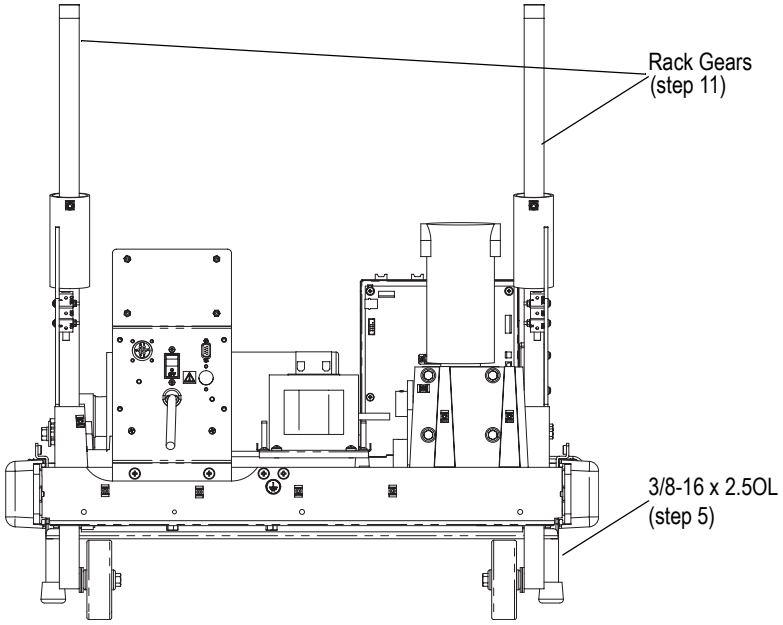


2. Verify that the pin has engaged by pulling lightly on the wire.
3. If no other service is required, replace the treadmill hood as described in step 9 on page 4-3.

Removing the Rack Gears

1. If the treadmill will change grade, set the grade to 12% (6-7°).
2. Lower the front of the headframe onto 6-inch wooden blocks to take the weight off the wheels.
3. Remove the treadmill hood and power as described in "Removing the Treadmill Hood" on page 4-3.
    - If the rack gear is jammed (no play in it), replace as described on page 4-17.
4. Restore power to the treadmill, connect it to the stress monitor system, and decrease the grade until the wheels are approximately half inch above the floor.

5. Remove the two hex-head bolts holding the wheels to the rack gears. Note the arrangement of washers used as spacers.



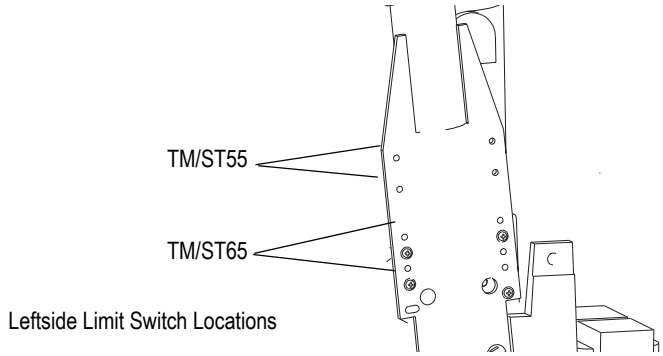
6. Remove the grade pot and bracket assembly (see step 6, “Replacing the Grade Potentiometer (Pot) on page 4-14).
7. Rotate the grade pot until a positive number appears in the grade display window of the stress monitor system. (Step 9 will not work until the number is positive.)
8. (Requires two people) Decrease grade until rack gears start bouncing on the pinion shaft. Hold the limit switches closed to let the rack gear travel beyond its normal range.
9. Turn off and unplug the treadmill.
10. Lift rack gears straight out top.

Reassembling the Rack Gears

Install new rack gears at the same time so that they extend an equal distance through the headframe.

1. Restore power to the treadmill.
2. Loosen the setscrew that secures the grade potentiometer gear and remove the gear.
3. Insert rack gears into headframe.
4. Decrease the grade until the gears bounce two or three times, then increase the grade. This should cause both rack gears to mesh in exactly the same place.

5. Run the rack gears down past the bottom of the headframe. Hold the limit switches closed to let the rack gear travel beyond its normal lower limit.



Leftside Limit Switch Locations

6. Check below the headframe to verify that the rack gears are meshing properly. The gears should protrude an equal distance.
7. Run the rack gears down until there is enough room to replace the wheels.
8. Bolt the wheels to the rack gears.
   a. Replace washers used as spacers in the correct arrangement.
   b. Torque the bolts tightly to 46 ft-lb ±4 ft-lb.
9. Increase the grade until the wheels touch the floor.
10. Grease the rack gears with wheel bearing grease.
11. Remove the blocks that support the headframe.
12. Reinstall the grade pot bracket and assembly.
13. Calibrate the grade potentiometer as described on page 4-26.
14. If no other service is required, turn the treadmill power off, remove the power cord from the outlet, and replace the treadmill hood as described in step 9 on page 4-3.

Replacing a Jammed Rack Gear

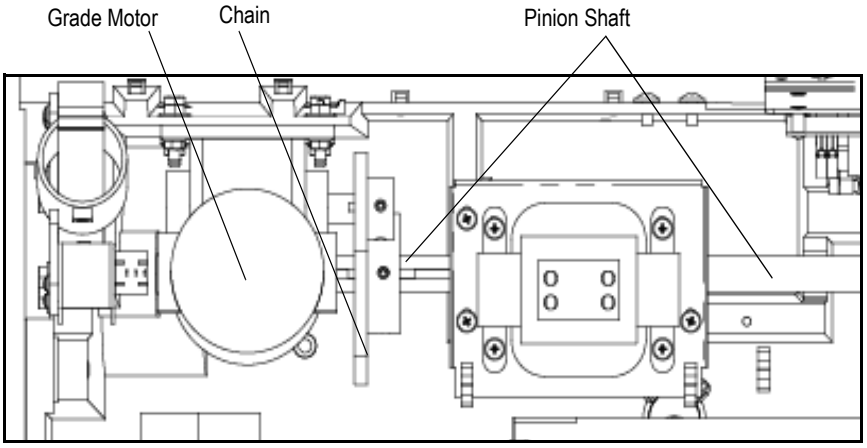
1. Remove the treadmill hood and power as described in “Removing the Treadmill Hood” on page 4-3.
2. Block the headframe securely with wooden blocks to take the weight off the wheels.
3. Shake each gear lightly at the top to determine which rack gear is jammed. If there is no play in a rack gear, it is jammed.
4. Remove the rack gear wheels from the rack gear. Note the arrangement of washers used as spacers.
5. Remove the side bumpers.
6. Remove the poly-V drive belt from the motor pulley.

7. Use a 9/16-inch socket wrench to remove the two hex-head bolts that hold each siderail to the headframe. Remove the deck assembly from the headframe.
8. Remove the grade pot bracket and assembly. Remove the four bolts that hold the handrail bracket in place and remove the bracket.
9. Slide the rack gear out sideways.
10. Inspect the gear on the pinion shaft. If it is damaged, replace both the rack gear and the pinion shaft as described below.
11. Bolt the handrail bracket back into place.
12. Reassemble the deck assembly and poly-V drive belt.
13. Restore power and decrease the grade to run the other rack gear out the top.
14. Reassemble the rack gear as described on page 4-16.
15. Calibrate the grade potentiometer as described on page 4-26.
16. Test the treadmill grade. Verify that:
    a. it operates over the full range of 0-25%.
    b. there is no binding when it moves up or down.
    c. the chain is aligned correctly. A popping sound in the chain indicates misalignment.
17. Turn the treadmill off and unplug it.
18. Replace the bumpers.
19. If no other service is required, replace the treadmill hood as described in step 9 on page 4-3.

Replacing the Pinion Shaft

1. Remove the deck assembly, (see “Removing the Deck Assembly from Headframe” on page 4-22) then remove the rack gear as previously described for jammed rack gears on page 4-17.

2. Restore power to the treadmill, then use the grade motor to turn the pinion shaft until the setscrew on the sprocket is visible.



3. Turn off the power and the treadmill circuit breaker, then unplug the treadmill.
4. Loosen the setscrews from the grade sprocket.
5. Remove the grade motor chain as described on page 4-13.
6. Remove the handrail support bracket on the right side.
7. Slide out the pinion shaft.
8. Slide the new pinion shaft into place: be sure to reinstall the grade sprocket and key while installing the pinion shaft.
9. Replace the handrail support bracket.
10. Use a straight edge to align the grade sprocket and grade motor sprocket, then tighten the setscrew.
11. Replace the grade motor chain as previously described.
12. Reassemble the deck assembly and poly-V drive belt.
13. Reassemble the rack gear.
14. Calibrate the grade potentiometer (see “Calibration Procedures” on page 4-26).
15. Test the treadmill grade. Verify that:
    a. it operates over the full range of 0-25%.
    b. there is no binding when it moves up or down.
    c. the grade motor chain is aligned correctly. A popping sound in the chain indicates misalignment.
16. Unplug the treadmill. If no other service is required, replace the treadmill hood as described in step 9 on page 4-3.
17. Replace the side bumpers.

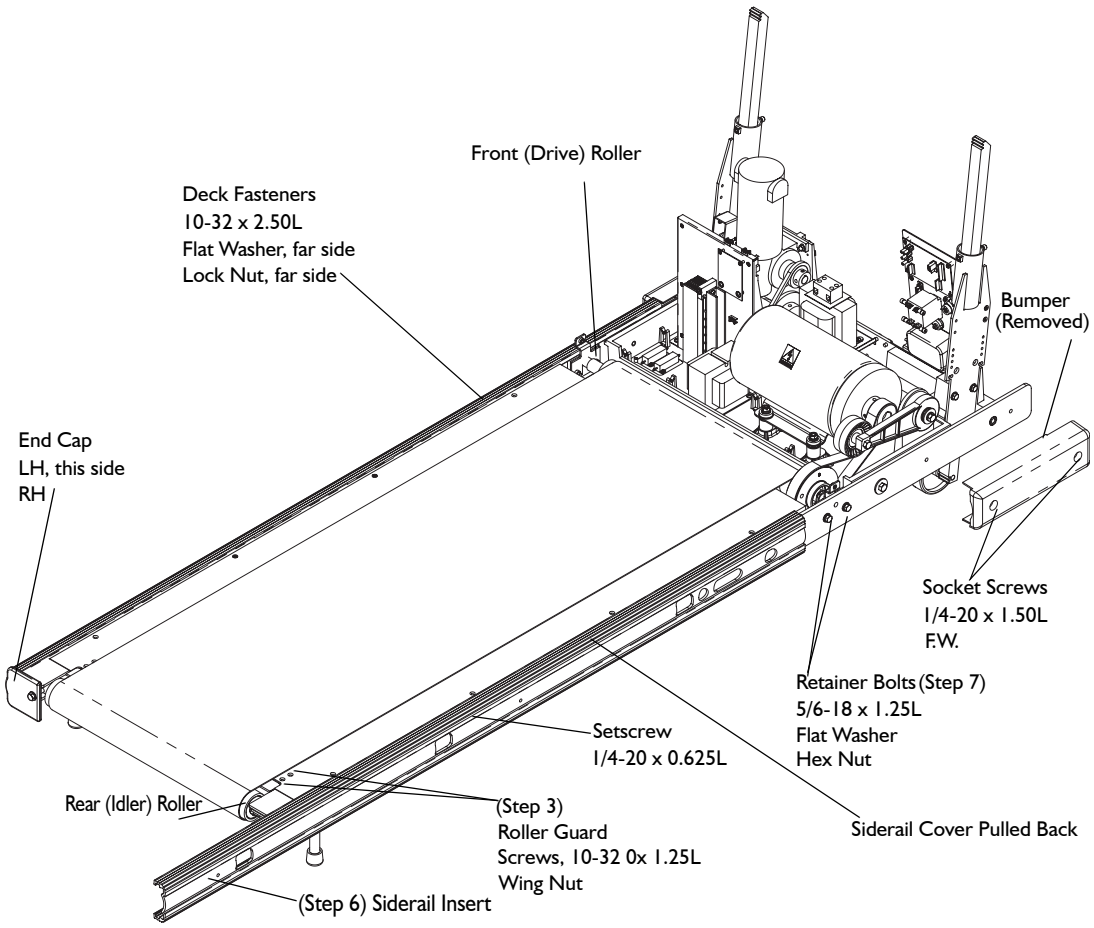
Adjusting the Grade Limit Switches

Grade limit switches prevent the treadmill from exceeding the preset maximum grade. When a roller on the limit switch reaches a trigger in each rack gear, a lever moves inward, opening the switch and stopping the grade motor. Two grade limit switches, one on each side of the treadmill, are mounted on brackets attached to the front of the headframe.

- Grade limit switch settings are preset at the factory and normally do not require adjustment. They should be adjusted if the rack gear is changed.

1. Remove the treadmill hood and power as described in "Removing the Treadmill Hood" on page 4-3.
2. Loosen, but do not remove, the two Phillips screws that secure each grade limit switch to its bracket.
3. Pivot the switch on the upper screw towards, then away from, the rack gear. You should hear a click as the switch opens or closes.
4. Set the switch wheel on a flat part of the rack gear. Pivot the switch towards the rack gear just until it clicks, then tighten both screws.
5. If required, repeat steps 2-4 for the other grade limit switch.
6. If no other service is required, replace the treadmill hood as described in step 9 on page 4-3.
7. Restore power and turn on circuit.
8. Operate the treadmill to verify that it reaches the upper and lower grade limits (25% and 0%).

Walking Deck Assembly



Replacing Rollers

1. Remove the treadmill hood and power as described in “Removing the Treadmill Hood” on page 4-3.
2. Remove optional siderails.
3. Remove the poly-V drive belt as previously described on page 4-8.
4. Loosen the four Phillips screws securing the rear roller guards. (Four wing nuts hold the screws in place on the underside of the treadmill.)
5. Remove the end caps from both sides of the belt at the rear of the walking platform.
6. Remove the siderail insert from one side of the deck, then loosen the two setscrews that hold the siderail covers to the siderails.
7. Slide the siderail cover back 10 inches.
8. Remove the four ½-inch hex bolts (two on each side) that hold the two front roller retainers to the siderail.
9. Slide the front roller up and out from the walking belt.

10. Pull the walking belt towards the rear of the deck, then slide the rear roller out from between the siderails toward the rear of the treadmill.
11. Replace the rollers and reassemble the treadmill following steps 1-10 in reverse order.
12. Adjust the walking belt tension and tracking using the procedures on the following pages.
13. Adjust the rear roller finger guards.

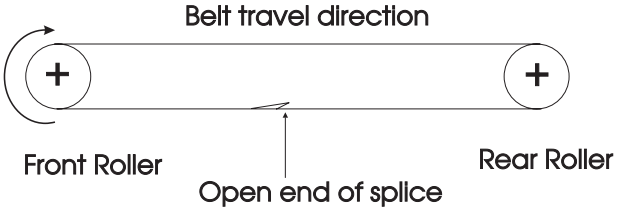
Removing the Deck Assembly from Headframe

- The following steps are oriented as though you were exercising on the treadmill.

1. Elevate the treadmill to 10% grade.
2. Remove the front and rear rollers as previously described in "Replacing Rollers" on page 4-21.
    - Most technicians remove only the left siderail bolts and cover. The belt slides on and off. Mark the location of the rail to the headframe before removing the bolts.
3. Remove the drive pulley bottom cover:
    a. Remove the two screws holding the cover to the headframe.
    b. Remove the two hex nuts holding the cover to the deck frame.
4. Use a wrench to remove the four bolts holding the deck frame to the headframe.
5. Slide the walking belt off the deck assembly.

Replacing the Walking Belt

1. Remove the walking belt (see "Removing the Deck Assembly from Headframe" on page 4-22).
    - When you install a new belt, verify that the closed end of the splice on the walking belt hits the roller first as the belt rotates.



2. Install a new belt, rough side up.
    - There is a direction arrow on the inside of the belt.
    - To prevent scratches, use a piece of the old belt between the headframe and the new belt.
3. Reassemble the treadmill following steps 1 and 2 in reverse order.

4. Adjust the belt tension and tracking.
5. Adjust the rear roller guards.

Removing the Deck

1. Remove the deck assembly including front and rear roller assemblies as previously described in “Removing the Deck Assembly from Headframe” on page 4-22.
2. Remove the Phillips screws holding the deck to the deck frame, then remove the deck.
    - ♦ The two front screws are longer and attach to the drive pulley cover underneath the treadmill.
3. To replace the deck, follow steps 1-2 in reverse order.
4. Adjust the belt tension and tracking.
5. Verify that the gap between the rear roller guards and the rear roller does not exceed three-eights inch (3/8”). Adjust as necessary.

Adjusting the Walking Belt

Belt Tension

Adjust the walking belt tension:

- whenever the belt slips or moves unsteadily during operation.
- after installing a new walking belt.
- each time you remove or replace the walking belt or deck.

Two adjustment methods are specified. Method 1 is preferred, but two belt tension calipers are required.

- ♦ Both adjustment screws must be completely slack before starting this procedure.

Method 1: Using Calipers

1. Turn both tension adjustment screws clockwise until most of the slack is removed from the belt.
    - ♦ Do not stretch the walking belt at this point.
2. Position one caliper on each side of the belt, approximately 18 inches from the rear roller assembly.
3. Grasp the belt with one caliper clamp.
4. Pull the slack out of the belt with your fingers, then grasp the belt with the second clamp.
5. Repeat steps 4 and 5 on the other side of the belt using the other caliper.

6. Set the dials of both calipers to zero.
7. Alternately tighten each tension adjustment screw in 0.1% increments until both sides read 0.4%. Be sure that the pointer is exactly on the line increment of the dial for each setting.

Caution! Do not overtighten the adjustment screws. Overtightening can damage the walking belt and roller assemblies.

8. Remove both gauges.
9. Adjust the walking belt tracking.

Method 2: Without Calipers

- Both adjustment screws must be completely slack before starting this procedure.

Use this method only if two belt tension calipers are not available. An accurate measuring device is required.

1. Turn both tension adjustment screws clockwise until most of the slack is removed from the belt.
   - Do not stretch the walking belt at this point.
2. Place two pieces of masking tape or two light pencil marks on the right edge of the belt exactly 50.000 inches apart.
3. Repeat step 2 on the left edge of the belt.
4. Alternately turn the left and right adjustment screws one-half turn until the distance between the tape or pencil marks is 50 13/64 inches ±1/64 on both sides.

Caution! Do not overtighten the adjustment screws. Overtightening may damage the walking belt and roller assemblies.

5. Remove the tape.
6. Adjust the walking belt tracking.

Walking Belt Tracking

Perform this procedure:

- whenever the belt moves to one side
- after installing a new walking belt.
- each time you adjust the walking belt tension.

Warning! Do not stand on the belt when adjusting the tracking. Do not start the treadmill when someone is on the walking belt.

1. Start the treadmill and let it run for at least one minute at minimum speed and grade.
2. Make the following adjustment to the right adjustment screw only:
   a. If the belt moves to the right, turn the screw ¼ turn clockwise.
   b. If the belt moves to the left, turn the screw ¼ turn counterclockwise.

3. Run the treadmill for at least one minute to observe the tracking. Adjustments to belt tracking take some time to become apparent.
4. Repeat steps 2 and 3 as required.

Caution! Do not overtighten the adjustment screw. Overtightening can damage the walking belt and assemblies.

5. Increase the speed to 8 mph, then repeat steps 2 and 3 as required.

Rear Roller Guard Adjustment

Check the position of the rear roller guards each time you readjust the belt tracking or the belt tension. The roller guards are located at the rear of the treadmill between the rear roller and the deck. Adjust the guards when the gap between the roller and the guard exceeds 3/8 in. (9.5 mm).

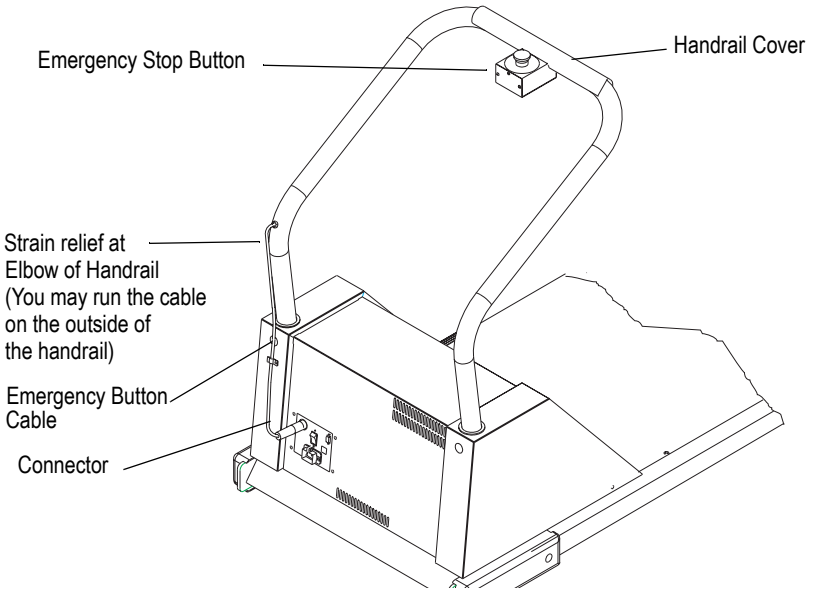
1. Loosen, but do not remove, the two screws attaching the rear roller guard to the deck (hold the nuts on the underside of the deck frame with your finger).
2. Slide the rear roller guard towards the rear roller until the gap between the two is approximately 3/16 inch.
3. Tighten the mounting screws loosened in step 1.

Caution! Do not let anyone stand on the treadmill belt when it is started.

4. Use the controls on the stress monitor to turn on the treadmill.

Replacing the Emergency Stop Switch

1. Turn off the treadmill circuit breaker and disconnect the power cord from the outlet.
2. Remove the seven screws from the switchbox cover and remove the cover.


Emergency Stop Button
Handrail Cover
Strain relief at Elbow of Handrail (You may run the cable on the outside of the handrail)
Emergency Button Cable
Connector

3. Disconnect the two wires attached to the switch.
4. Loosen, but do not remove, the two screws that hold the switch housing and the button assembly together.
5. Twist and separate the button assembly from the switch housing.
6. Reassemble using steps 2 through 5 in reverse order.
    - You can run the cable on the outside of the handrail.
7. Restore power and test operation.

Replacing the Emergency Stop Cable

1. Turn off the treadmill circuit breaker and unplug the power cords.
2. Remove the handrail cover.
3. Remove the seven screws from the switchbox beneath the emergency stop button.
4. Disconnect the cable from the switch and pass it through the hole in the handrail.
5. Remove the strain relief located at the elbow of the handrail, grab the cable where it extends from the rail, and pull it out.
6. Disconnect the cable from the configuration plate.
7. Place a strain relief on the handrail, then pass the new cable through it, directing it up through the hole in the handrail.
8. Attach the cable wires to the emergency switch: the wires are interchangeable.
9. Replace the switchbox cover and the handrail cover.
10. Connect the cable to the configuration plate.
11. Restore the power and test operation.

Calibration Procedures

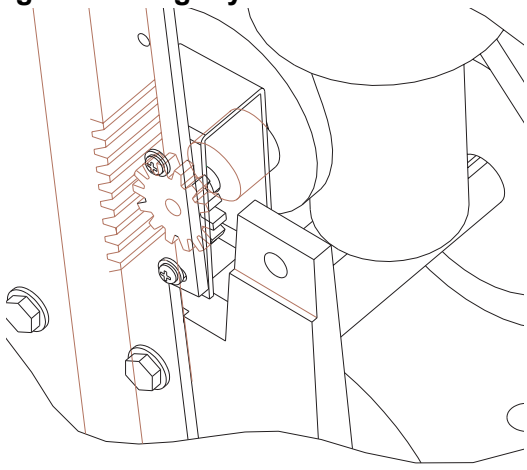
Grade Potentiometer (Pot) Calibration

Calibrate the grade pot whenever specified in the procedures in this chapter.

1. Remove the treadmill hood and power as described in “Removing the Treadmill Hood” on page 4-3.
2. Restore power to the treadmill.
3. Measure from the bottom of the siderail to the floor at both the front and rear of the treadmill. Adjust the grade until both measurements are identical.
4. Lower the grade until the treadmill is level.

5. Loosen the screw that holds the grade pot sprocket to the grade pot. This may require removing, then replacing the two Phillips screws from the pot assembly bracket.
6. Place a flathead screwdriver through the handrail bracket and turn the pot shaft until the stress monitor displays zero grade.
7. Position the bracket so that the gear is meshed with the rack gear teeth (see illustration below) and tighten the screws loosened in step 5.

Caution! **To prevent damage when replacing the bracket, don't mesh gears too tightly. Leave 1/16 in. clearance for each gear.**



8. Verify that the treadmill operates through its full grade range (0 – 25%) and that the treadmill is nearly all the way to the top of the rack gear when the display reads 25%.
9. Turn off the power and disconnect the power cord from the power outlet.
10. Unplug the treadmill. If no other service is required, replace the treadmill hood as described in step 9 on page 4-3.
11. Reinstall the siderails and bumpers, if previously removed.

Speed and Grade

The circuitry in the treadmill is self-calibrating for speed and grade. No additional calibration is required.

5

Preventative Maintenance

Warning! **Before working on the treadmill or its components, turn off the treadmill circuit breaker and unplug the power cords.**

High voltages remain under the treadmill hood for a few minutes even after the plug has been removed.

Secure long hair, loose clothing, and jewelry before working near the treadmill, particularly near the walking surface or pulleys.

Do not permit anyone to stand on the treadmill belt when it is started.

Recommended Service

Routine service is necessary every six (6) months. When service is required, repairs can be done to the modular level.

Routine Maintenance

Visual Inspection

- Inspect the treadmill power cord for wear. Inspect all connector cables and the power receptacle. Check for worn or damaged plastic coverings, frayed or broken wires, cracked connections, and other signs of damage.
- Inspect the walking belt for wear. Be sure it is not rubbing against the frame. The belt should be centered within 0.25 inch of the sides; adjust if necessary.
- Check the handrail(s) and optional emergency stop button to be sure they are fastened securely.
- Remove potential hazards from the treadmill area.

Cleaning the Treadmill Surfaces

Follow these steps to clean the treadmill after servicing or as required:

1. Elevate the treadmill to maximum height and vacuum the floor under it to prevent excess dust and dirt from interfering with operation.
2. Clean the treadmill exterior with a damp sponge, then dry thoroughly.

Caution! **Never wipe the deck under the belt, even when replacing a belt. Wiping can damage the surface.**

Do not use detergents or cleaning agents on any part of the deck.

Do not let liquid enter the treadmill interior. If it does, inspect and test the equipment for safety before using it again.

Disinfection

Disinfection, when necessary, is the responsibility of the individual facility, which should follow its own established procedure. Do not use liquids on the deck surface.

Vacuuming Under the Treadmill Hood

Dust and dirt beneath the hood can restrict the air flow needed to cool the unit and dissipate heat from the drive motor and drive board on the AC Drive Module. To prevent damage to components, periodically vacuum the mechanical drive and the area behind the AC Drive Module.

Frequency

Treadmill use and environment determine how much dust accumulates and how frequently you need to vacuum the components. Inspect the internal components at least every six months. Adjust the inspection schedule as needed If significant accumulations occur more frequently, vacuum as needed.

Warning! **To avoid electric shock, turn off the treadmill circuit breaker and unplug the treadmill and stress monitor power cords before removing the hood. Before working near components, wait at least two minutes from the time you unplugged the power cord. Be sure the red LED on the drive board on the AC Drive Module is off.**

The power control on the stress monitor does not turn off electrical current to the treadmill.

Caution! **Use extreme caution to avoid physical damage to the internal components. Avoid static discharge, which can damage the electronic components.**

1. Remove the hood as described in “Removing the Treadmill Hood” on page 4-3.

2. Vacuum the areas behind the AC module (deck side). Do not vacuum the drive board on the AC Drive Module.
3. Vacuum the fan opening.
4. Replace the hood.

Replacement Schedules

Belts should be replaced if they are frayed or show excessive wear.

Electrical Testing

Electrical testing is to be done by the facility's biomedical department as required. Check the leakage current of the treadmill periodically—at least every nine months—to be sure it does not exceed local standards. See Appendix B, Specifications, for limitations.

A

Safety Requirements

Cautions and Warnings

- Read this manual in full before operating the treadmill.
- Before each use of this equipment, check the power receptacle for signs of damage. Do not operate the equipment if the integrity of these items is in question.
- Be sure the connection for the optional Emergency Off switch is secure. Test the switch to verify proper operation. Do not operate the equipment if the integrity of these items is in question.
- Regularly inspect cables and treadmill belts for wear or damage. Do not operate the equipment if the integrity of these items is in question.
- When connecting auxiliary equipment approved for use with the monitoring system, be certain the summation leakage current does not exceed local or provincial standards.
- The treadmill must be on an appropriate, dedicated electrical circuit with a power rating that meets the electrical specification on the treadmill serial number label. Nothing else should be connected to the circuit.
- To avoid potential safety and electrical problems, use parts and accessories that meet specifications as noted in this service manual and the user guide for your stress monitor.
- Use of accessories or cables other than those specified, with the exception of accessories or cables sold by Quinton Cardiology, Inc. as replacement parts for internal components, may result in increased emissions or decreased immunity of the treadmill.
- This equipment is classified Class I, Type B, ordinary equipment, not protected against fluid ingress. It is rated for continuous operation.

- The Cardiac Stress Treadmill needs special precautions regarding EMC and needs to be installed and put into service according to the guidelines of the EMC declaration tables.
- Portable and mobile RF communications equipment may affect the Cardiac Stress Treadmill and the recommended separation distances in the EMC declaration tables should be observed.
- The Cardiac Stress Treadmill should not be used adjacent to or stacked with other equipment. If adjacent or stacked use is necessary, the Cardiac Stress Treadmill should be observed to verify normal operation in the configuration in which it will be used.
- Do not operate this equipment in the presence of flammable anesthetic mixtures.
- Increased risk due to leakage current can result if this equipment is not grounded properly.
- Failure to follow these guidelines can produce a serious or possibly fatal electrical shock hazard. Consult a qualified electrician as required.
- Do not start the treadmill when someone is standing on the belt.
- Keep speed and grade at the lowest settings when getting on and off the treadmill belt.
- Never place chairs or other objects on treadmills.
- Keep the area underneath and around the treadmill clear. Make sure cables are clear of the treadmill.
- Be aware of a moving treadmill belt.
- Allow sufficient room for patients to maneuver around the system and to safely mount and dismount the treadmill.
- Ensure the patient understands the proper treadmill mount and dismount procedure.
- Patient should straddle the treadmill belt or stand on the deck’s edge at start up.
- The patient should always face the front of the treadmill when stepping on or off the belt. Do not step onto the belt while facing the side of the treadmill.
- At the end of the test, patient should hold the handrail and step off to the side of the treadmill.
- Properly train new staff.

- If your treadmill is equipped with the rapid deceleration profile, it is specifically designed to come to a rapid stop. This feature requires that attendant(s) are available to support and assist the patient user. Attendants MUST be in a position to support and assist the patient when the belt stops.

EMC Declaration Tables

Guidance and Manufacturer's Declaration - Electromagnetic Emissions

The Cardiac Stress Treadmills are intended for use in the electromagnetic environment specified below. The customer or the user of the Cardiac Stress Treadmills should assure that they are used in such an environment.

Emissions test	Compliance	Electromagnetic environment - guidance
RF emissions CISPR 11	Group 1	The Cardiac Stress Treadmills use RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class A	The Cardiac Stress Treadmills are suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

NOTE Tests verified with shielded input/output cables only.

Guidance and Manufacturer's Declaration - Electromagnetic Immunity

The Cardiac Stress Treadmills are intended for use in the electromagnetic environment specified below. The customer or the user of the Cardiac Stress Treadmills should assure that they are used in such an environment.

Immunity test	IEC 60601 test level	Compliance Level	Electromagnetic environment - guidance
Electrostatic discharge (ESD) IEC 61000-4-2	+ 6kV contact + 8 kV air	+ 6kV contact + 8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	+2 kV for power supply lines +1 kV for input/ output lines	+2 kV for power supply lines +1 kV for input/ output lines	Mains power quality should be that of a typical commercial or hospital environment
Surge IEC 61000-4-5	+ 1 kV differential mode +2 kV common mode	+ 1 kV differential mode +2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% U_T (>95% dip in U_T) for 0.5 cycle <40% U_T (>60% dip in U_T) for 5 cycle <70% U_T (>30% dip in U_T) for25 cycle <5% U_T (>95% dip in U_T) for 5 sec	<5% U_T (>95% dip in U_T) for 0.5 cycle <40% U_T (>60% dip in U_T) for 5 cycle <70% U_T (>30% dip in U_T) for25 cycle <5% U_T (>95% dip in U_T) for 5 sec	Mains power quality should be that of a typical commercial or hospital environment. If the user of the ST/ TM55 or ST/TM65 requires continued operation during power mains interruptions, it is recommended that the ST/TM55 or ST/TM65 be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) Magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment

NOTE 1: UT is the a.c. mains voltage prior to application of the test level.
NOTE 2: Tests verified with shielded input/output cables only.

Guidance and Manufacturer's Declaration - Electromagnetic Immunity

The Cardiac Stress Treadmills are intended for use in the electromagnetic environment specified below. The customer or the user of the Cardiac Stress Treadmills should assure that they are used in such an environment.

Immunity test	IEC 60601 test level	Compliance Level	Electromagnetic environment - guidance
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 V	Portable and mobile RF communications equipment should be used no closer to any part of the ST/TM55 or ST/TM65, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d = 1.2\sqrt{P}$
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	3 V/m	$d = 1.2\sqrt{P}$ 80 MHz to 800 MHz $d = 2.3\sqrt{P}$ 800 MHz to 2.5 GHz where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey[a], should be less than the compliance level in each frequency range[b] Interference may occur in the vicinity of equipment marked with the following symbol:

NOTE 1: At 80 MHz and 800 MHz, the higher frequency range applies.
NOTE 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.
NOTE 3: Tests were verified with shielded input/output cables only.

a.Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the ST/TM55 or ST/TM65 is used exceeds the applicable RF compliance level above, the ST/TM55 or ST/TM65 should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the ST/TM55 or ST/TM65.

b.Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

Recommended Separation Distances Between Portable and Mobile RF Communications Equipment and the Cardiac Stress Treadmills

The Cardiac Stress Treadmills are intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the Cardiac Stress Treadmills can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Cardiac Stress Treadmills as recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter W	Separation distance according to frequency of transmitter m		
	150 kHz to 80 MHz $d = 1.2\sqrt{P}$	80 MHz to 800 MHz $d = 1.2\sqrt{P}$	800 MHz to 2.5 GHz $d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance d in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE 1 At 80 MHz and 800 MHz, the higher frequency range applies.

NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

NOTE 3 Tests were verified with shielded input/output cables only.

B

Specifications

Cardiac Stress Treadmills Specifications

The following specifications apply to the Cardiac Stress treadmills except where noted.

Performance	
Maximum Rated Load	500 lb (227.3 kg) (with restrictions -- see Speed/ Weight graph on next page)
Belt Speed Range (Continuously Adjustable)	0.8 to 9.6 mph (1.3 to 15.4 km/h) ±0.2 mph
Grade Range	0 to 25% ±0.5%
Physical	
Weight	ST/TM55: 352 lb (160 kg) ST/TM65: 375 lb (170 kg)
Nominal Walking Area	ST/TM55: 20 in. x 55 in. (51 cm x 140 cm) ST/TM65: 20 in. x 65 in. (51 cm x 165 cm)
Treadmill Area	ST/TM55: 29.9 in. x 80.2 in. (76 cm x 204 cm) ST/TM65: 29.9 in. x 90.2 in. (76 cm x 229 cm)
Walking Surface Height	7.0 in. (18 cm) from floor
Handrail Height	47.2 in. (120 cm) from floor
Environmental	
Temperature	Operating: 50 to 104°F (10 to 40° C) Storage: -40 to 158°F (-40 to 70°C)
Humidity (non-condensing)	Operating: 15 to 95% relative Storage: 5 to 95% relative

Power Requirements

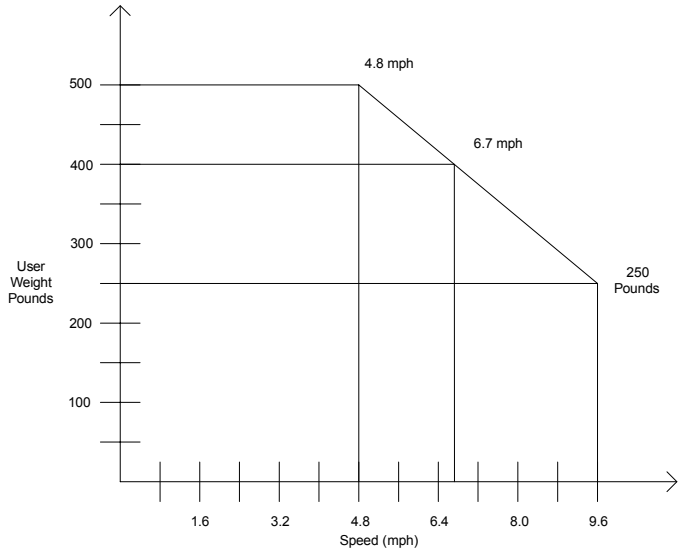
Listed below are the power requirements for your treadmill

Nominal Voltage Range (min - max) / Hertz*	Current Draw (Amps)	Min. Branch Circuit Amps
100-120 V, 50/60 Hz	20**	20
200-240 V, 50/60 Hz	10**	10

* The nominal voltage range is listed on the serial number name plate, which can be found on the hood under the circuit breaker switch.

**Full-load current is computed as described in section 430-24 of the National Electrical Code.

Speed Vs. Weight Range



Performance Envelope 115V or 230V Operation

C

Part Numbers

Final Assemblies

Refer to the name plate located under the power cord on the hood for the part number for your treadmill assembly.

Spares

Item	Part Number
ELECTRICAL	
Power Cord	
Low Voltage Treadmill	030610-004
High Voltage Treadmill	030736-042
Strain Relief (Connector Lock), Power Cord	
Low Voltage Treadmill	001227-011
High Voltage Treadmill	031453-011
Configuration Plate Assembly	
Low Voltage	037083-001
Low Voltage With Emergency Stop Button	037083-002
High Voltage	037083-003
High Voltage With Emergency Stop Button	037083-004
AC Drive Module	042153-001
BUS Recovery System Assembly Harness	033167-001
DRIVE	
Drive Motor Assembly	037098-001
Flywheel Assembly	032446-001
Drive Belt	032387-001
Tensioner Assembly	032784-001
Transformer Assembly	032706-001
GRADE	

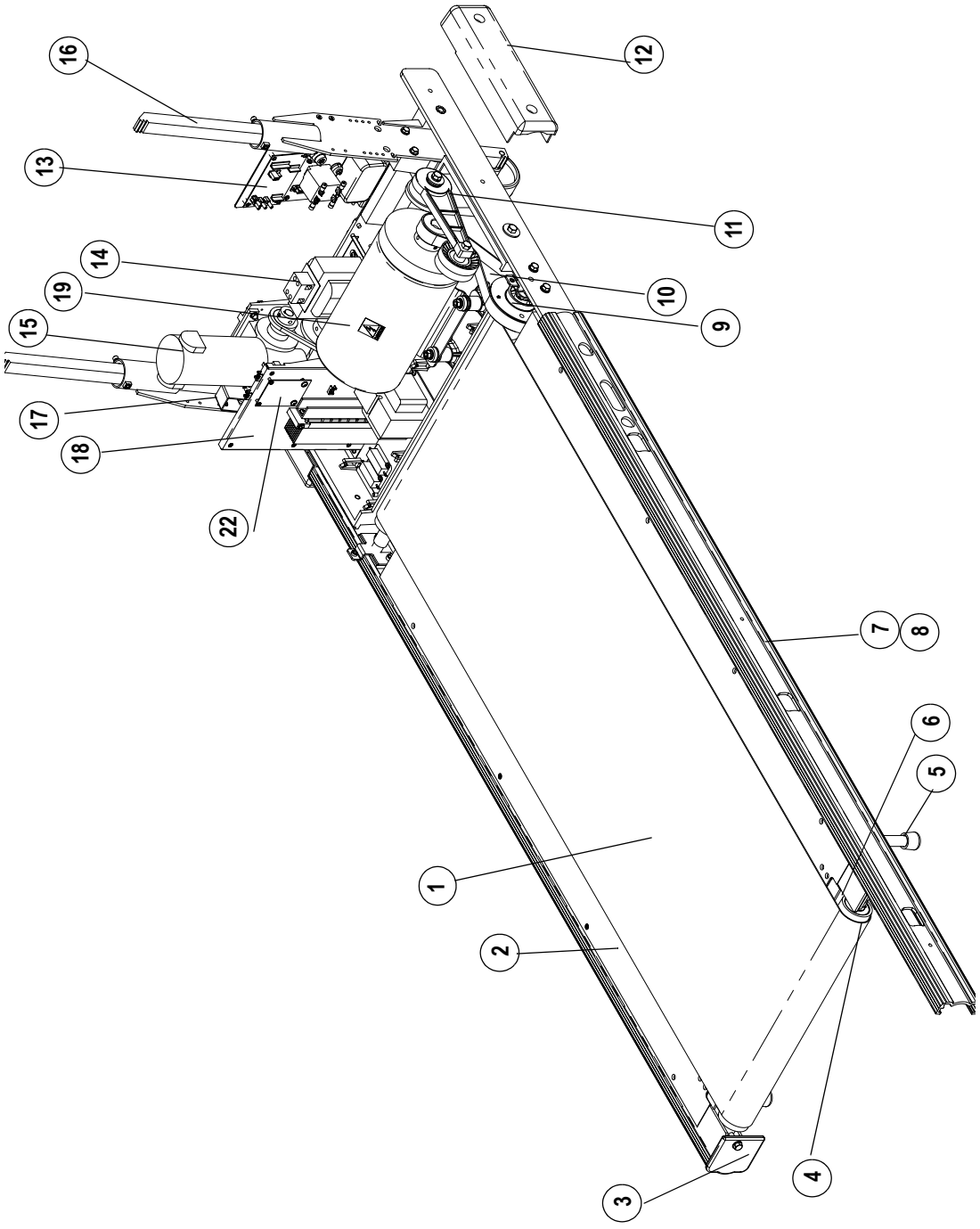
Grade Motor Assembly	033316-002
Grade POT Assembly	033171-002
Grade Wheel Kit	033502-002
Pinion Shaft	013044-001
Grade Chain Kit	030448-001
Sprocket, Chain, Grade Motor	019081-004
Deck	
Deck ST/TM55 ST/TM65	 030205-004 030205-005
Front Roller	033507-003
Rear Roller Assembly	033508-002
Walkbelt ST/TM55 ST/TM65	 033510-001 033510-002
Bumper	031194-002
End Cap, Rear Left	032641-001
End Cap, Rear Right	032640-001
Side Handrail Kit, Short, TM55	032758-001
Side Handrail Kit, Short, TM65	032758-002
Side Handrail Kit, Long, TM55	032759-001
Side Handrail Kit, Long, TM65	032759-002
Side Handrail Cover, Short	036734-001
Side Handrail Cover, Long	036734-002
Front Handrail Cover--for units with emergency stop button	036734-003
Front Handrail Cover--for units without emergency stop button	036734-001
Hardware	
Spare Hardware	033372-002
Miscellaneous	
Emergency Stop Button Option	037080-001
Rapid Deceleration Option	037082-xxx

Placement of Spare Parts

This list shows the basic numbering for each spare part. The following drawings show where the part is located.

ITEM #	Part Number	Description
1	033510-001	BELT-WALKING 123" BLOCK DESIGN (55" TREADMILL)
1	033510-002	BELT-WALKING 143" BLOCK DESIGN (65" TREADMILL)
2	030205-004	SLIDER BED (55" TREADMILL)
2	030205-005	SLIDER BED (65" TREADMILL)
3	032640-001	RH END CAP CASTING
3	032641-001	LH END CAP CASTING
4	033508-002	REAR PULLEY (ROLLER)
5	014639-001	FOOT, REAR, TREADMILL
6	031516-001	ROLLER GUARD WELDMENT
7	032752-001	PLASTIC EXTRUSION, 55" TREADMILL
7	032752-002	PLASTIC EXTRUSION, 65" TREADMILL
8	032804-004	INSERT, PLASTIC EXTRUSION, BLUE
9	033507-003	DRIVE ROLLER ASSY
10	032387-001	POLY-V DRIVE BELT
11	032784-001	ASSY, ROTARY TENSIONER, PULLEY, AND ARM
12	031194-002	BUMPER, GRAY
13	037083-001	ASSY, CONFIG PLATE, LOW VOLTAGE
13	037083-002	ASSY, CONFIG PLATE, LOW VOLTAGE, E-STOP
13	037083-003	ASSY, CONFIG PLATE, HIGH VOLTAGE
13	037083-004	ASSY, CONFIG PLATE, HIGH VOLTAGE, E-STOP
14	042027-001	CHOKE, PFC (for CE marked units ONLY)
15	033316-002	MOTOR ASSEMBLY, GRADE
16	032798-001	MODIFIED RACK GEAR
17	033171-002	ASSY, GRADE POT
18	042153-001	SPARE, AC DRIVE MODULE
19	037098-001	DRIVE MOTOR, AC VARIABLE
20	033167-001	HARNESS ASSY, BUS RECOVERY
21	032706-001	TRANSFORMER, VARIALBLE AC
22	032780-003	PCBA, DIGITAL INTERFACE
23	032446-001	FLYWHEEL ASSY

ITEM #	Part Number	Description
24	013044-001	PINION SHAFT
25	030448-001	#40 CHAIN & LINK KIT
26	019082-001	SWITCH, SNAP ACTION
27	033502-002	WHEEL, 4", BALL/ROLLER BEARING
28	032362-002	HOOD ASSEMBLY (No labels)
29	037080-001	EMERGENY SHUTOFF SWITCH - FIELD INSTALLATION KIT
30	036734-001	HANDGRIP VINYL, BLUE
30	036734-003	HANDGRIP VINYL, BLUE, W/ E-STOP
31	032978-001	HANDRAIL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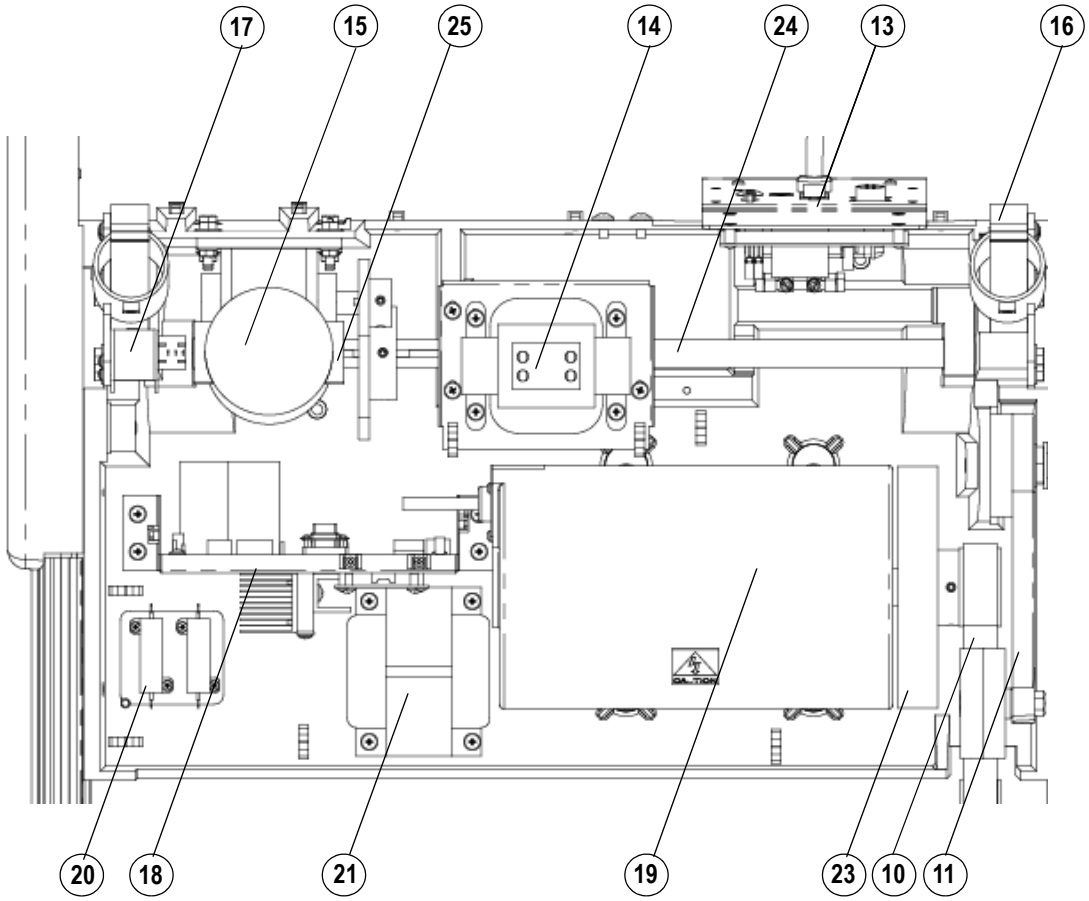
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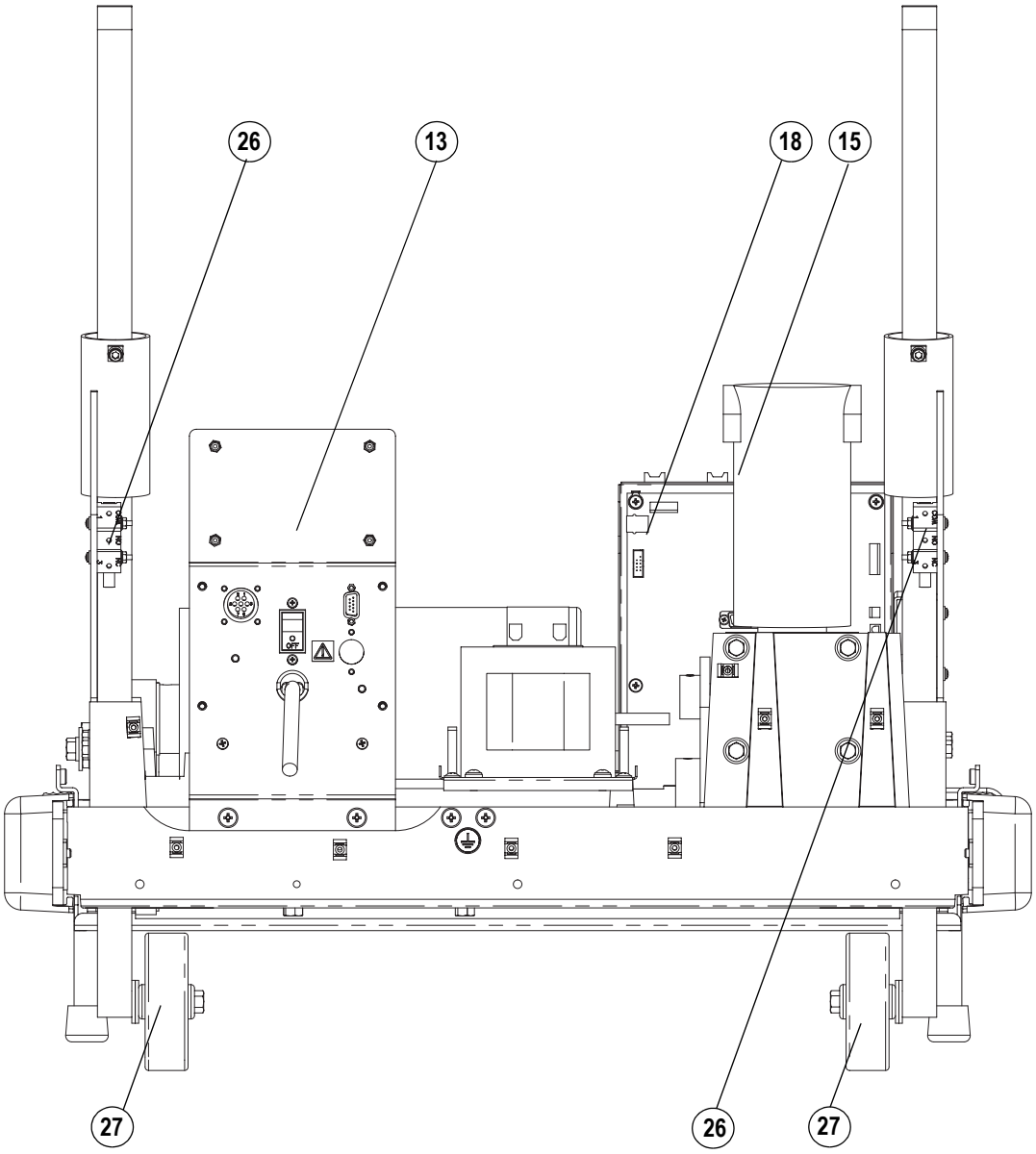
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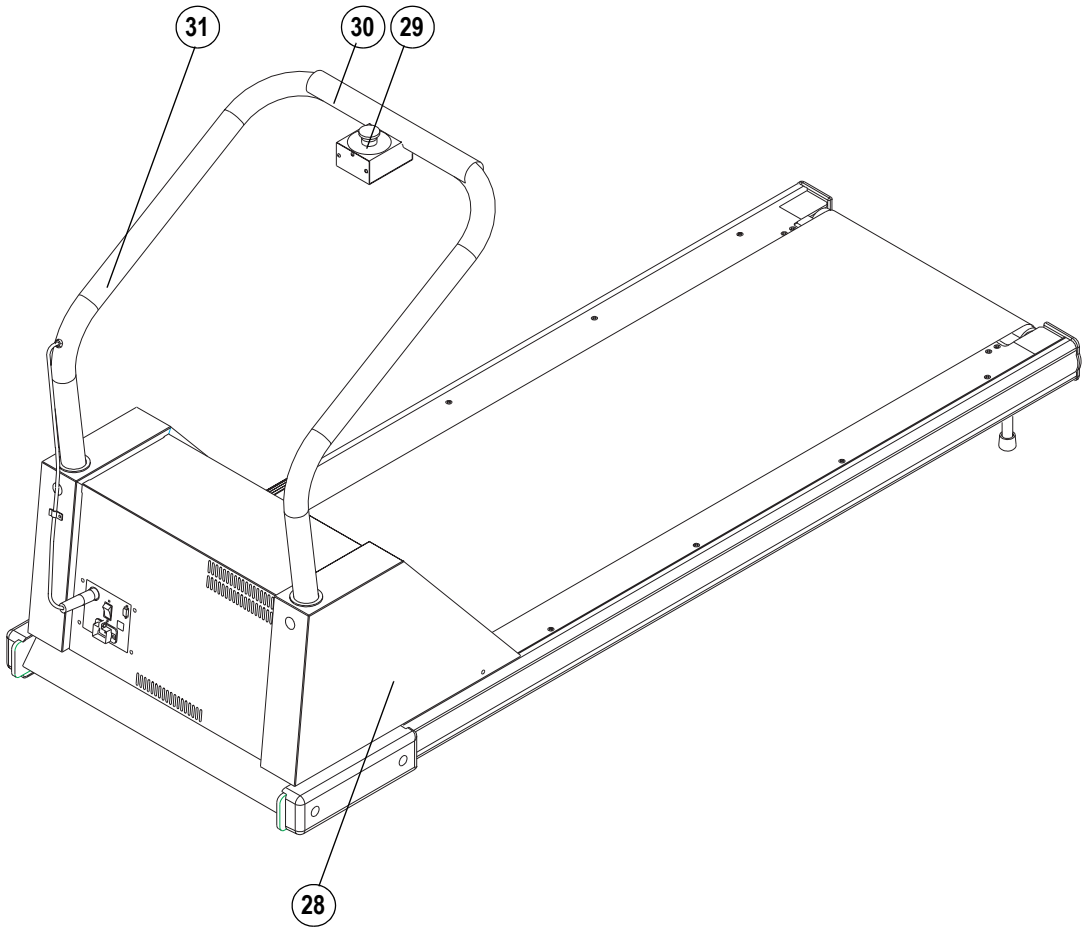
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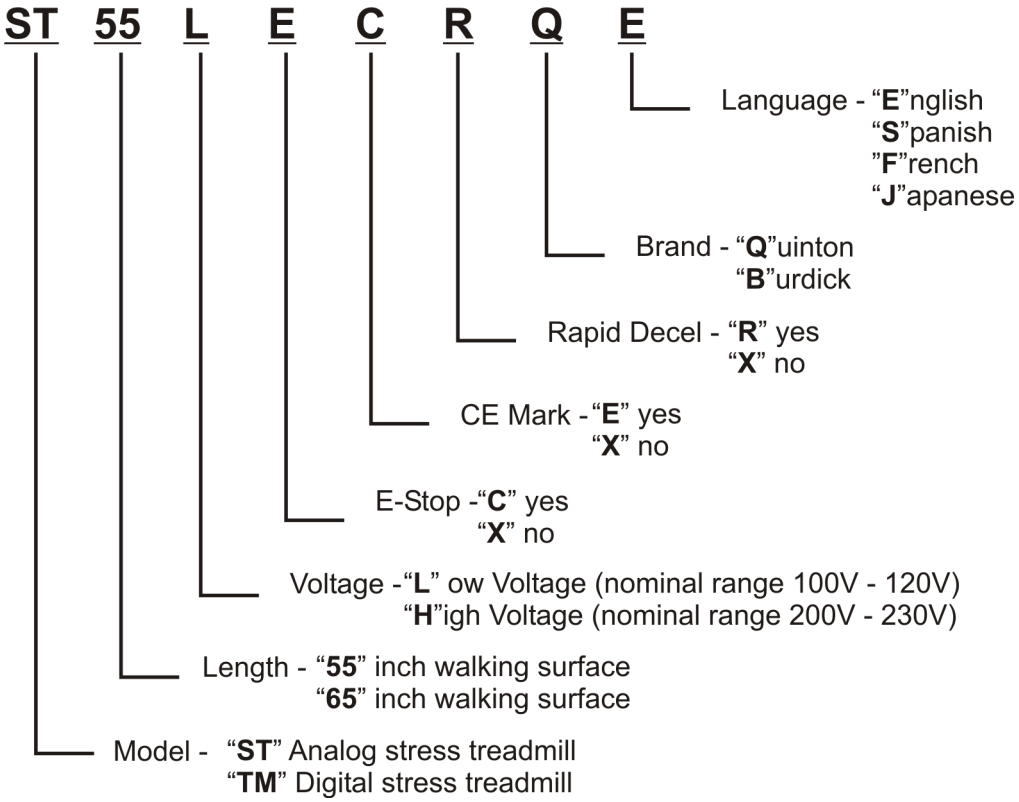
Treadmill Part Number Configuration



Rules:

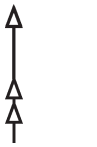
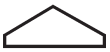
- ST models are not available as a Burdick-branded treadmill.
- CE units will always have the E-Stop.
- CE units are available only in High Voltage

D

Symbol Definitions

Quinton products display one or more of the following symbols and warning labels for your protection. No single product displays all.

	Attention: Consult accompanying documents		Earth ground (protective)
	Off (power disconnected from mains)		Type B equipment - provides adequate protection against electric shock, particularly regarding allowable leakage current; reliability of the protective earth connection (when present)
	On (power connected to mains)		Type BF equipment - contains an F-type isolated patient applied part providing a high degree of protection against electric shock
	Alternating current		Type BF equipment with defibrillation protection
	High voltage		Type CF equipment - contains an F-type isolated patient applied part and provides a degree of protection against electric shock higher than that for type BF equipment regarding allowable leakage currents
	Earth ground (functional)		Type CF equipment with defibrillation protection
	Replace fuse only as marked		Fuse
	Mains power		Equipotentiality

	Decreases grade of treadmill walking belt		Increases grade of treadmill walking belt
	Speeds up treadmill walking belt		Slows treadmill walking belt
Warning	Warning	T	Timed fuse (slo-blo)
Hz	Hertz	V	Volts
A	Amperes	VA	Volt Amperes

Drawings

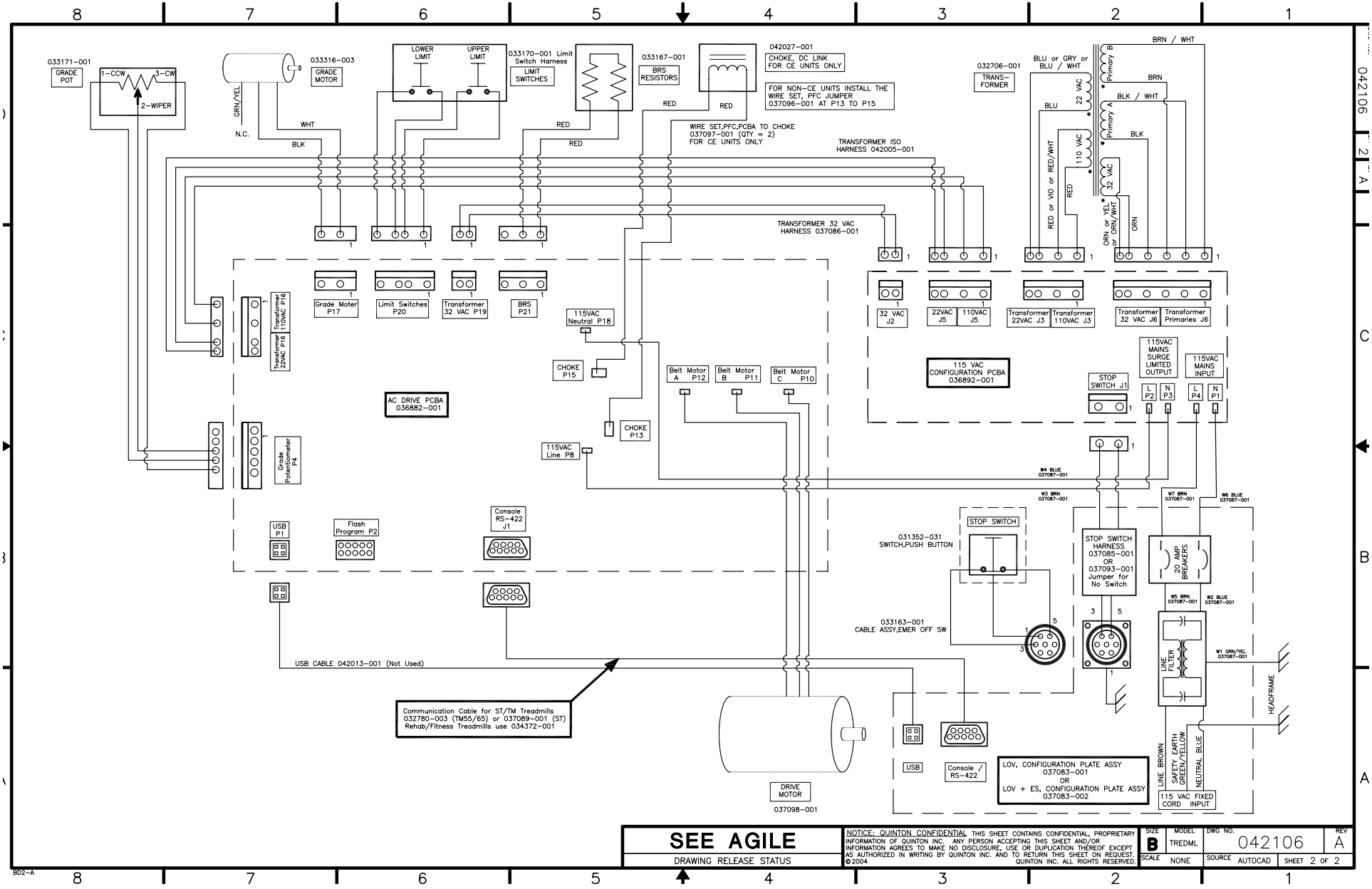
Wiring Diagrams

These wiring diagrams for both the low voltage and high voltage treadmill models are shown as follows:

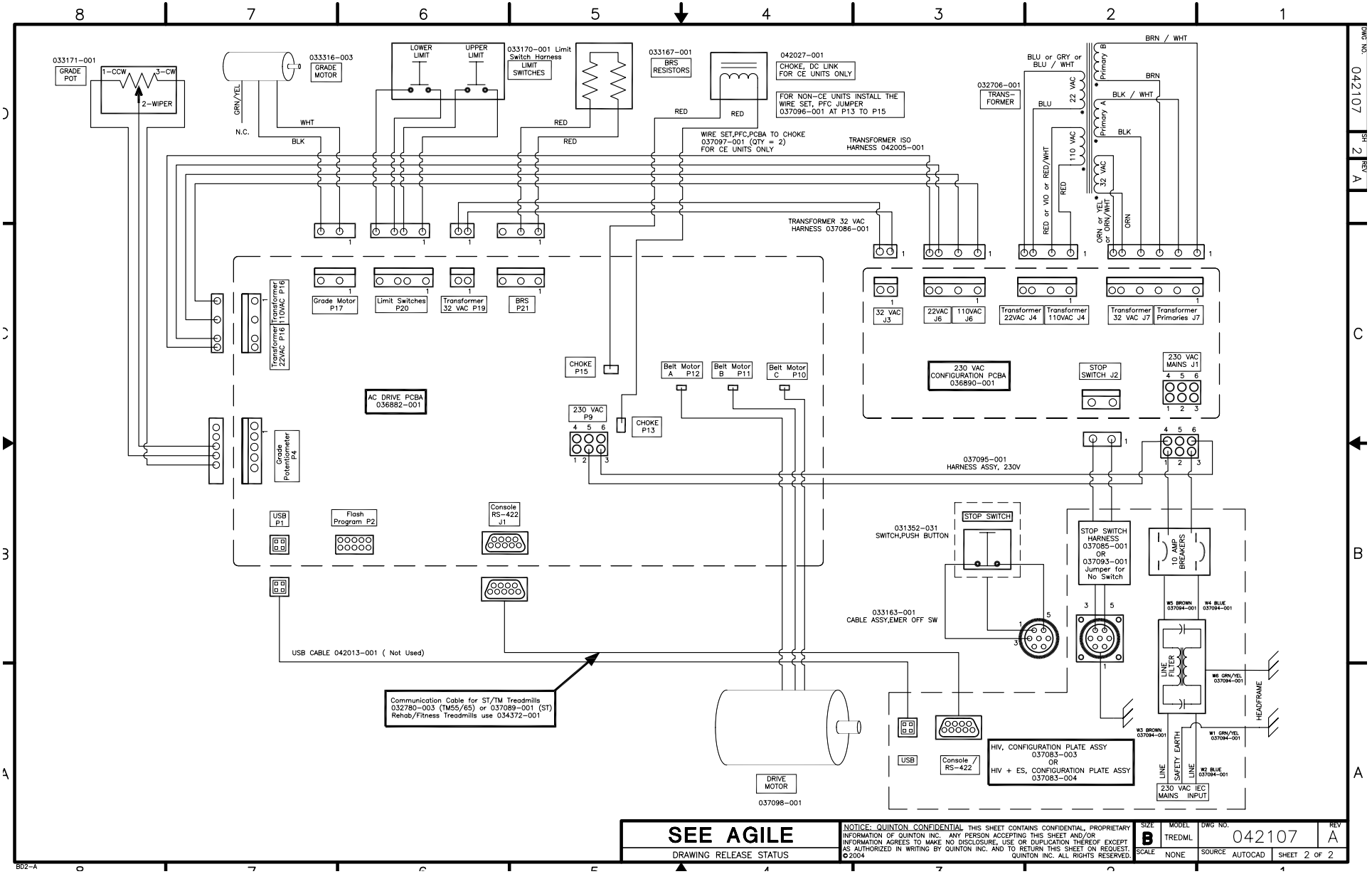
“Wiring Diagram, Low Voltage Treadmill” on page E-3

“Wiring Diagram, High Voltage Treadmill” on page E-4.

Wiring Diagram, Low Voltage Treadmill



Wiring Diagram, High Voltage Treadmill



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